

Exam Code: 508301

Paper Code: 1245

Programme: Master of Commerce (FYIP)

Semester – I

Course Title: Introductory Accounting

Course Code: FCOL-1093

Time: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

Section-A

1. Define accounting. Explain its features and objectives. Discuss the advantages and limitations of accounting in modern business organizations.
2. What are Generally Accepted Accounting Principles (GAAP)? Discuss in detail the main accounting concepts and conventions that guide the preparation of financial statements.

Section-B

3. Explain the accounting process in detail with reference to the preparation of journal entries and posting them to ledger accounts. Illustrate your answer with suitable examples.
4. Define depreciation. Discuss the causes, objectives and factors of depreciation.

Section-C

5. Explain the meaning, objectives and advantages of a Trial Balance. Discuss how it helps in detecting accounting errors.
6. Define accounting errors. Explain the different types of accounting errors with suitable examples.

Section-D

7. Define a Non-Profit Organization (NPO). Explain its features and discuss the differences between Receipts and Payments Account and Income and Expenditure Account.
8. Write short notes on the following adjustments and explain how each is treated in the final accounts:
 - (a) Bad debts and provision for doubtful debts
 - (b) Discounts on debtors and creditors
 - (c) Reserves for contingencies
 - (d) Interest on Capital
 - (e) Interest on Drawings
 - (f) Manager's Commission

**Exam Code: 508301
(80)**

Paper Code: 1246

**Programme: Master of Commerce (FYIP)
Semester-I**

Course Title: Business Law

Course Code: FCOL-1094

Time Allowed: 3 Hours

Max Marks: 70

Note: Students are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. Each question carries 14 marks.

Section -A

1. Define the term 'Contract'. Discuss the classification of contract in detail.
2. What remedies are available for breach of contract under the Indian Contract Act, 1872?

Section -B

3. Define Bailment. Explain the rights and duties of bailor and bailee.
4. Discuss the rights and duties of an agent towards the principal

Section -C

5. Explain the rules regarding transfer of ownership (property in goods) from seller to buyer.
6. Discuss the performance of a contract of sale. What are the duties of the buyer and seller?

Section -D

7. Explain in detail the rights and duties of partners as provided in the Partnership Act.
8. Discuss in detail the various modes of dissolution of a firm under the Indian Partnership Act, 1932.

Paper Code: 1114

Programme	Exam Code	Course Code
Master of Commerce (FYIP)	508301	FCOL-1102
Master of Science (Mathematics)(FYIP)	112411	FMAL-1102
Master of Science (Physics) (FYIP)	508601	FPHL-1102

Semester – I**Course Title: Communicative English – I****Time Allowed: 3 Hours****Max Marks: 35**

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 7 Marks. (5*7=35)

Section-A**Q1. Write down the meaning of the following words: (1 x 7=7)**

- | | | | |
|-----------|---------------|--------------|------------|
| i. Knotty | ii. Efface | iii. Grisly | iv. Barren |
| v. Dolt | vi. Inaudible | vii. Loutish | |

Q2. Write the correct usage of the following words: (1 x 7=7)

- | | |
|------------------------|----------------------------|
| i. New innovations | ii. Consensus of Opinion |
| iii. Entirely complete | iv. Past experience |
| v. At the near future | vi. Remember the fact that |
| vii. Frown to | |

Section-B**Q3. Write a letter to the editor of the local newspaper of your town concerning about "Bad roads in your locality" (1 x 7=7)****Q4. A popular music group is performing in your city. Write a report covering different aspects of the event. (1 x 7=7)****Section- C****Q5. For each sentence circle the continuing idea: (1 x 7=7)**

- The ancient Greeks and Egyptians knew a great deal about the movements of the Earth and the positions of the stars. Some people believe that this knowledge helped sailors from ancient Greece or Egypt to reach America over three thousand years ago.
- The workers are asking for a 20 percent wage increase, longer vacations, and better medical insurance. These demands may be too expensive for the company to agree to.
- In high school, students who have no interest in the subject often disturb the class. This makes it harder for students who really want to learn.
- To improve health care, the government would need to raise taxes by more than 10 percent. Such an increase now, six months before the next election, would be unpopular with most politicians.
- A number of developing countries have tried to introduce birth-control programs. These attempts have often failed because the family planning experts did not know enough about the lives and traditions of the people.
- The traffic was very slow on the interstate this morning. This made me thirty minutes late for my class.

vii. Tom's father did not get angry with him when Tom had an accident and wrecked the family car.

Q6. In the following sentences, circle the Cause and Effect Markers. Circle each cause and mark it with a C. Underline each effect and mark it with an E. (1 x 7=7)

- i. In the 1990s, world oil prices fell and stayed low. This brought about an improvement in the economies of countries that import oil.
- ii. On account of the bad weather, the baseball game has been canceled.
- iii. Two months ago, a large factory closed down. This resulted in fifteen hundred people losing their jobs.
- iv. The prices of new cars are forcing many people to keep their old cars longer than they used to.
- v. A lack of rain is creating problems for farmers. Their crops are not growing well.
- vi. Some human diseases have been associated with chemicals in the environment.
- vii. Because of a severe storm in the area, our plane was three hours late taking off.

Section-D

Q7. Complete the sentences with words from the list: (1 x 7=7)

symbol, flow, in succession, symbol, hardships, integrated, diversity, oppression, in transition, process

- i. The statue of Liberty may be the world's best-known _____ of freedom. For millions of immigrants, it signified the hope of a better future.
- ii. In late 1840s, the _____ of Irish immigrants into the United States became very strong.
- iii. You know that an immigrant family is becoming _____ into its new society if language shift takes place in its second or third generation.
- iv. Many immigrants to America left Europe to escape the religious _____ that caused friends and family members to suffer.
- v. Life in America had its own _____ for Irish immigrants in the 1850s. Because of anti-Irish prejudice, they had difficulties getting good jobs.
- vi. One feature of Indian society is the _____ of languages that are spoken there. The country has more than 1600 different languages.
- vii. For three years _____ in 1840s, a new disease destroyed the potatoes in Ireland.

Q8. Write the synonyms:

(1 x 7=7)

- i. To keep something in good condition
- ii. The food the body needs
- iii. Big enough to be important
- iv. To have sufficient money
- v. To describe something as greater than it really is
- vi. Worldwide
- vii. Against the law

Exam Code : 508301

Paper Code: 9120

Programme: Master of Commerce (FYIP) Semester –I

Course Title: Descriptive Statistics for Business

Course Code FCOL-1173

Time Allowed : 3 hours

Max. Marks: 80

Note: Attempt five questions in all selecting at least one question from each section. The fifth question can be attempted from any section. Each question carries 16 marks.

Section-A

- 1 Explain the various types of variables with examples.
- 2 a) Distinguish between quantitative data and qualitative data
b) Distinguish between population and sample

Section -B

- 3 The following data show students' preferences regarding different lipstick brands—Lakme (L), Colour Bar (B), Revlon (R), Sugar (S).

B, B, L, R, S, S, L, B, S, L, B, S, L, L, B, R, R, S, S, S, L, B, L, B, R, R, R, S, S, L, B

- a) Construct a frequency distribution and a relative frequency distribution
- b) A Pie-chart

- 4 Consider the following data regarding the marks of students

55 35 35 32 34 28 32 35 45 42 47 37 38 29 25 27 23
26 28 27 31 39 36 31 41 43 49 48 36 39

- a) Construct a frequency distribution
- b) Draw a histogram and a frequency curve

Section-C

5. a) Find out the arithmetic mean from the following data

Size	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	8	12	15	7	3	5

- b) Discuss the merits and demerits of the mode

6. a) Calculate the standard deviation and coefficient of variation from the following data

X	0-10	10-20	20-30	30-40	40-50	50-60
F	6	8	16	12	6	2

- b) Discuss the merits and demerits of quartile deviation.

Section –D

7. a) From the following data, find out the correlation coefficient between age and playing habits

Age	17	18	19	20	21	22
No. of Players	20	27	34	36	40	30

- b) Find out the properties of regression coefficients

8. Find out the skewness from the following data

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70
No. of students	4	9	10	16	8	6	7

(For Reappear Candidates Only (Session 2023-24))

Exam Code: 508301

Paper Code: 9124

Programme: Master of Commerce (FYIP) (Semester-I)

Course Title: Microeconomics

Course Code: FCOL-1174

Time allowed: 3 Hours.

Max Marks: 80

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question can be attempted from any Section. Each question carries 16 marks.

Section-A

1. Discuss the nature and scope of microeconomics and highlight the difference between micro and macroeconomics.
2. Explain elasticity of demand and describe the different methods of measuring price elasticity. Why is elasticity important for business firms?

Section-B

3. What are indifference curves? Explain their assumptions and properties.
4. Define returns to scale and distinguish between returns to a factor and returns to scale. Discuss the optimal combination of inputs with the help of isoquants.

Section-C

5. Discuss the objectives of a firm other than profit maximization. How do these objectives affect pricing decisions?
6. Explain the equilibrium of a monopoly firm in the short and long run. Illustrate with diagrams.

Section-D

7. Compare monopolistic competition and perfect competition. What is excess capacity, and why does it arise under monopolistic competition?
8. What is an oligopoly? Explain the Kinked Demand Curve model.

Exam Code: 508301
(20)

Paper Code: 1110

Programme: Master of Commerce (FYIP) -I

Course Title: Punjab History and Culture

Course Code: FCOL-1431

Time Allowed: 3 Hours

Max Marks: 35

Note : Candidates shall attempt 5 questions in 500 words, at least selecting one question from each section and the 5th question may be attempted from any of the four sections. Each question will carry 07 marks.

Section-I

1. Describe the physical features of Punjab.
2. Briefly describe the salient features of Bhakti Movement.

Section-II

3. Describe the teachings of Guru Nanak Dev Ji.
4. Describe the contribution of Guru Amar Das ji in the development of Sikhism.

Section-III

5. Briefly describe the New Policy of Guru Hargobind.
6. Critically evaluate the circumstances leading to the martyrdom of Guru Tegh Bahadur ji.

Section-IV

7. Give a brief account of the creation of Khalsa Panth by Guru Gobind Singh.
8. Discuss the achievements of Banda Bahadur.

Hindi Version

Section-I

1. पंजाब की भौतिक विशेषताओं का वर्णन कीजिए।
2. भक्ति आंदोलन की प्रमुख विशेषताओं का संक्षेप में वर्णन कीजिए।

Section-II

3. गुरु नानक देव जी की शिक्षाओं का वर्णन करें।
4. सिख धर्म के विकास में गुरु अमर दास जी के योगदान का वर्णन करें।

Section-III

5. गुरु हरगोबिंद की नई नीति का संक्षेप में वर्णन करें।
6. गुरु तेग बहादुर जी की शहादत की परिस्थितियों का आलोचनात्मक विवरण दें।

Section-IV

7. गुरु गोबिंद सिंह द्वारा खालसा के निर्माण का संक्षिप्त विवरण दें।
8. बंदा बहादुर की उपलब्धियों की विवेचना कीजिए।

Exam Code: 508301
(80)

Paper Code: 1247

Programme: Master of Commerce (FYIP)
Semester-I

Course Title: Principles and Practices of Management

Course Code: FCOM-1095

Time Allowed: 3 Hours

Max Marks: 50

Note: Attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 10 marks.

SECTION-A

1. Define Management. Discuss in detail various functions of Management. (10)
2. Explain Taylor's and Fayol's theories of Management? (10)

SECTION-B

3. What is planning and discuss various steps involved in the planning process. (10)
4. Briefly explain different types of organizational structures. Highlight their advantages and disadvantages. (10)

SECTION-C

5. Explain different theories of Motivation with suitable examples. (10)
6. What is Leadership? Explain different styles of leadership. (10)

SECTION-D

7. Explain the process of communication with the help of a suitable diagram. Discuss how feedback plays a vital role in ensuring effective communication. (10)
8. What is Controlling? Explain different types of Controls. (10)

(For Reappear Candidates Only 2023-24)

Exam Code: 508301

Paper Code: 9122

Programme: Master of Commerce (FYIP) (Semester-I)

Course Title: Financial Accounting

Course Code: FCOM-1096

Time Allowed: 3 Hours

Max Marks: 50

Note: Attempt five questions in all, selecting at least one question from each section. The fifth question can be attempted from any Section. Each question carries 10 marks.

Section- A

1. What is Financial Accounting? Explain its Nature, Scope and Limitations. 10
2. What is Accounting Equation? Prove that the two sides of equation are always equal. 10

Section- B

3. Journalise the following transactions in the books of Mr. Vikas: 10

Date	Transaction	Amount (₹)
Sept.1	Cash balance	3,500
	Bank balance	20,000
	Stock	3,800
	Furniture	1,200
	Buildings	25,000
	Debtors	8,400
	Creditors	5,200
Sept.2	Cash purchases (including IGST ₹850)	2,850
Sept.3	Received cheque from L.K. Das and deposited into bank	3,600
Sept.5	Settled the account of J.K. Traders by paying cash.	3,500
	Received discount	50
Sept.7	Withdrawn cash from bank	8,000
Sept.8	Cheque of L.K. Das got dishonoured	
Sept.9	Paid cheque on behalf of customer Sahu	300
Sept.12	Collected from debtors of last year	4,500
Sept.20	Paid LIC Premium for Mr. Vikas	500
Sept.25	Commission receivable	250
Sept.27	Goods given as charity	275
Sept.30	Rent due from Yogesh	250

4. What is a Cash Book? Explain and illustrate different types of cash book. 10

Section- C

5. Define Depreciation. Explain Straight Line Method and Written Down Value method of charging depreciation along with suitable examples. 10
6. Give Journal Entries to rectify the following errors:
 1. Goods purchased from Amit for ₹ 2,600 were recorded in Sales Book by mistake.
 2. Goods for ₹ 4,400 sold to Suresh was passed through Purchase Book.
 3. A customer returned goods worth ₹ 1,000. It was recorded in 'Purchase Returns Book'.

4. A credit sale of ₹ 126 to Rohit was entered in the books as ₹ 162.
5. Sale of old chairs and Table for ₹ 700 was treated as sale of goods.
6. Rent of proprietor's residence, ₹ 800, debited to Rent A/c.

10

Section- D

7. Jagat submits to you the following trial balance. Prepare Trading and Profit & Loss Account for the year ending 2017 and Balance Sheet as on 31st December 2017.

Name of the Account	Debit (₹)	Credit (₹)
Opening stock	50,000	
Furniture	1,00,000	
Plant and machinery	3,50,000	
S. Debtors	50,000	
Wages	5,000	
Salaries	12,000	
Bad debts	1,000	
Purchases	1,20,000	
Power & fuel	1,500	
Telephone charges	2,000	
S. Creditors		60,000
Sales		3,80,000
Return inward	10,000	
Return outward		15,000
Freight	2,500	
Capital		5,82,000
Commission		5,000
General Expenses	3,000	
Insurance	5,000	
Cash	15,000	
Bank	25,000	
Building	4,00,000	
Drawings	40,000	
Loan from a friend		1,50,000
Total	11,92,000	11,92,000

Adjustments:

- (i) Closing stock was ₹1,20,000.
- (ii) Provide depreciation on building @ 10% p.a. and plant and machinery @20% p.a.
- (iii) During the year goods worth ₹5,000 were lost by Fire. Insurance company admitted the claim for ₹4,000.
- (iv) Create provision for bad debts @5%.
- (v) Goods worth ₹ 2,000 were withdrawn for personal use.
- (vi) Included in plant and machinery was a machine purchased for ₹1, 00,000 on 1st October 2017.
- (vii) Insurance premium paid in advance ₹500.
- (viii) Interest on loan @10% is due for the year.

10

8. Following Receipts and Payment account is prepared from the cash book of Amar Charitable Trust, Delhi for the year ended 31st March, 2007:

Receipts	Amount (₹)	Payments	Amount (₹)
To Balance b/d		By Salaries	12,000
Cash in hand	2,000	By Insurance	3,000
Cash in current A/c	4,000	By Printing & Stationary	2,000
Cash in deposits	5,000	By Advertisements	7,000
To Donations	6,000	By Postage	500
To Legacies	8,000	By Furniture	5,000
To Interest on Investments	1,000	By Investments	10,000
To Endowment Fund receipts	2,500	By Advance for Building	8,000
To Subscription	25,000	By Balance c/d	
To Life membership subscription	3,000	Cash in hand	1,000
		Cash in current A/c	6,000
		Cash in deposits	2,000
	56,500		56,500

Prepare Income and Expenditure account and Balance Sheet as on 31-03-2007 after considering the following:

- (i) 50% of donations and legacies are to be capitalised.
- (ii) Provide for salaries ₹1,000 and advertisements ₹500.
- (iii) Salaries prepaid is ₹800 on 1-4-06.
- (iv) Interest ₹200 is accrued on investment.
- (v) Subscription due: 31-3-06 ₹1,800 and 31-03-07 ₹1,200.
- (vi) Insurance prepaid on 31-3-07 ₹1,000.

Exam Code: 508301
(80)

Paper Code: 1248

Programme: Master of Commerce (FYIP)
Semester-I

Course Title: Digital Fluency

Course Code: FCOM-1126

Time Allowed: 3 Hours

Max Marks: 40

Note: Attempt five questions, selecting one question from each section. The fifth question may be attempted from any section. Each question carries 8 marks.

Section A

1. Explain the role of selection in copying text. Explain how creatively copy and paste can be used? How it is different from copy and paste?
2. What do you mean by header and footer? How these are customized? How different header/footer are incorporated in same document? Explain with the help of suitable examples.

Section B

3. Explain various math functions used in spreadsheet with suitable examples.

4. Explain the following:-
 - a) Fill handle
 - b) Data types of cell

Section C

5. How a chart is inserted in spreadsheet? Explain different components of bar chart with suitable example.
6. Explain various types of layouts of a slide in presentation software.

Section D

7. Explain the use of transition and animation in the presentation. How these are applied?
8. Explain different views available in presentation software in detail.

Exam Code: 508303
(80)

Paper Code: 3228

Programme: Master of Commerce (FYIP)
Semester-III

Course Title: Company Law

Course Code: FCOL-3092 ✓

Time Allowed: 3 Hours

Max Marks: 70

Note:- Attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 14 marks.

Section A

1. What is Corporate Veil? Explain the statutory provisions relating to the lifting of the Corporate Veil. (14)
2. Define a Company. Explain different provisions relating to formation of Companies. (14)

SECTION-B

3. What do you mean by Memorandum of Association? What are its clauses and how these can be altered? (14)
4. What is Prospectus? Explain the liabilities for Mis-Statement in Prospectus. (14)

SECTION-C

5. What do you mean by a Share? Explain general and special provisions related to allotment of shares. (14)
6. What are the various modes of acquiring membership in a company? Explain the rights and liabilities of members of a company. (14)

SECTION-D

7. What do you mean by winding up of company? What are the different modes of Winding up. (14)
8. What are the requisites of a valid meeting under Companies Act 2013. (14)

Exam Code: 508303

Paper Code: 3230

Programme: Master of Commerce (FYIP) Semester III

Course Title: Fundamentals of Insurance

Course Code: FCOL-3094 ✓

Time Allowed: 3 Hrs.

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

Section - A

Q1) "Insurance is a device to share risk." Discuss this statement in the context of purpose, benefits and principles of insurance.

Q2) "Fire and Marine insurance are contracts of indemnity while Life insurance is not." Briefly explain this statement and discuss the differences between Life, Fire and Marine insurance.

Section - B

Q3) Examine the role and significance of the IRDA Act, 1999 (Insurance Regulatory and Development Authority Act). How did it transform the Indian insurance sector?

Q4) What is premium? Explain the methods of computation of premium in life insurance. Discuss net premium, gross premium, loading and mortality tables.

Section - C

Q5) What is a First Premium Receipt? Describe its contents and legal value? How does first premium receipt serve as temporary evidence of insurance coverage?

Q6) What is the role of training in improving the performance of insurance agents? Briefly explain training methods and benefits to both agents and insurers.

Section - D

Q7) What is Bancassurance? Describe its models, benefits to insurers, challenges and its impact on distribution channels in India.

Q8) Describe the concept of consumer service in the insurance sector. Explain its importance, key service dimensions and service quality improvement.

Exam Code: 508303

Paper Code: 3227 - R

Programme: Master of Commerce (FYIP) Semester - III

Course Title: Soft Skills and Communication

Course Code: FCOL-3101 ✓

Time Allowed: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all selecting one from each section and the fifth question from any of the four sections. Each question carries 14 marks. (14×5=70 Marks)

Section-A

1. How can interpersonal skills be developed and improved? Discuss the role of interpersonal skills in the workplace.
2. Define leadership. Explain the relationship between leadership and communication. Explain the barriers to effective leadership communication.

Section-B

3. What are the key differences between a Job Application Letter and a Résumé? How does communication skill play an important role in writing a Job Application?
4. What is a Situational Dialogue? Write a situational dialogue between a customer and a salesperson about a defective product.

Section-C

5. What are the different types of Body Language? Explain with examples.
6. Define E-mail Etiquette and its importance in workplace.

Section-D

7. How can social media impact a company's reputation positively and negatively?
8. Explain the process of planning and creating a successful blog post.

Exam Code: 508303
(80)

Paper Code: 3227

Programme: Master of Commerce (FYIP)
Semester-III

Course Title: Soft Skills and Communication

Course Code: FCOL-3101 ✓

Time Allowed: 3 Hours

Max Marks: 70

Note:.. Attempt five questions in all, selecting one from each section and the fifth question from any of the four sections
Each question carries 14 marks. (14×5=70 Marks)

Section-A

1. What are interpersonal skills? Describe the key components of interpersonal skills with examples.
2. What is leadership and communication? Explain the barriers to effective leadership communication and suggest ways to overcome them.

Section-B

3. What is a Job Application? Explain its importance in the recruitment process. What are the essential parts of a Job Application Letter?
4. Write your Resume for the post of computer operator.

Section-C

5. How does Body Language affect Business or Professional Communication? Explain the role of haptics (touch) in non-verbal communication.
6. Explain the basic interview skills and its importance.

Section-D

7. What is e-mail etiquette? Why is it important? What are some dos and don'ts of e-mail etiquette?
8. What tools and applications are required for video conferencing? Explain video conferencing etiquette for professional meetings.

Exam Code: 508303

Paper Code: 3232

Programme: Master of Commerce (FYIP) Semester III

Course Title: Workshop on Data Analysis through Statistical
Software

Course Code: FCOM-3170 ✓

Time Allowed: 1.30 Hrs.

Max. Marks: 20

Note: Attempt five questions, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 4 marks. Use of simple calculator and Graph paper is allowed.

Section A

1. Define data editing. What are techniques and importance of data editing?
2. Discuss various types of data.

Section B

3. Calculate mean.

Class interval	10-25	25-40	40-55	55-70	70-85	85-100
Number of students	2	3	7	6	6	6

4. Define median. What are the merits and demerits of median?

Section C

5. Define skewness. Distinguish between positively and negatively skewed distributions.

6. The number of employees, wages per employee and variance of the wage per employee for factories are given as follow:

	Factory A	Factory B
Number of employees (n)	50	100
Average wage per employee per week (Rs.) ($\bar{X}$)	120	85
Variance of the wages per employee per week (Rs.) (σ^2)	9	16

Find out coefficient of variation and discuss in which factory is there greater variation in the distribution of wages per employee?

Section D

7. Define Box plot with examples and interpret it.
8. Draw suitable diagram to present the following information.

Family Item	Food	Cloth	Rent	Fuel and Light	Miss.	Total
A	400	200	160	80	160	1000
B	500	400	200	100	400	1600

Exam Code: 508303
(80)

Paper Code: 3229

Programme: Master of Commerce (FYIP)
Semester-III

Course Title: Elementary Statistics

Course Code: FCOL-3173

Time Allowed: 3 Hours

Max Marks: 70

Note: 1.) Question paper comprises of four sections.

2.) Each section contains two questions with internal choice.

3.) Candidates are required to attempt five questions, selecting atleast one question from each section. The fifth question may be attempted from any section. Each question carries 14 marks.

4.) Use of simple calculator, Log & statistical table and Graph paper is allowed.

Section A

1. (a) Define Statistics. Discuss its uses in Economics and Business and points out its limitations.
(b) Calculate geometric mean of marks:

Marks	15	20	22	25	30
No. of Students:	1	3	4	2	2

2. (a) Find the values of Median and Quartiles from the following table:

Marks (Less than)	10	20	30	40	50	60
No. of Students:	4	10	20	40	47	50

- (b) Discuss the relationship between A.M., G.M. and H.M. (10, 4)

Section B

3. (a) Define tabulation. Explain the main parts and purpose of tabulation of statistical data. Also draw the specimen of a table.

- (b) Construct frequency polygon for the following data:

Age (Years):	17 - 19	19 - 21	21 - 23	23 - 25	25 - 27	27 - 29	29 - 31
Frequency:	7	13	24	30	22	15	6

(7, 7)

4. A factory produces two types of electric lamps A and B. In a experiment relating to their life, the following results were obtained:

Length of life	500-700	700-900	900-1100	1100-1300	1300-1500	Total
No. of Lamps A	5	11	26	10	8	60
No. of Lamps B	4	30	12	8	6	60

Compare the variability of the life of two varieties using coefficient of variations. (14)

Section C

5. (a) In a bolt factory Machines A, B and C manufacture respectively 20%, 30% and 50% of the total of its output. Of them 5, 4 and 2 percent respectively are defective bolts. A bolt is drawn at random from the product and is found to be defective. What is the probability that it was manufactured by machine B?
 (b) Eight fair coins are tossed simultaneously. Find the probability of getting exactly 6 heads.

(7, 7)

6. Define Normal distribution. Explain the properties of Normal distribution in detail. Bring out its importance in statistics. (14)

Section D

7. What is random sampling? Discuss its various types with the help of an example. (14)

8. A population consists of five numbers (2, 3, 6, 8, 11). Draw all possible samples of size two which can be drawn with replacement from this population. Construct the sampling distribution of means. Also, find the mean and standard error of the distribution.

(14)

(For Reappear Candidates Only (2024-25))

Exam Code : 508303

Paper Code : 9339

Master of Commerce (FYIP) (Semester-III)

Course Title: Analytical Skills

Course Code: FCOL-3331

Time Allowed : 3 Hours

Max. Marks : 80

Note: Attempt five questions in all selecting at least one question from each section. The fifth question can be attempted from any section. Each question carries 16 marks.

Section- A

1 Study the following table carefully and answer the questions :

Number of the candidates (in lakhs) appearing in an entrance examination from six different cities

City	A	B	C	D	E	F
Number of the candidates	1.25	3.14	1.08	2.27	1.85	2.73

Ratio of candidates passing and failing within the cities

City	Ratio of passing and failing
A	7:3
B	5:3
C	4:5
D	1:3
E	3:2
F	7:5

(A) What is the ratio of the number of candidates failing the exam from City D so that of these failing the exam from City A ?

(B) The number of candidates appearing for the exam City C is what per cent of the number of the candidates appearing for the exam from City B ?

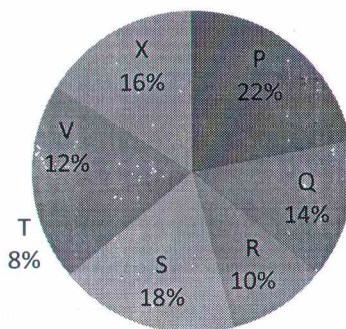
(C) Which city has the highest number of students failing the entrance exam ?

(D) What is the number of candidates passing the exam from City E ?

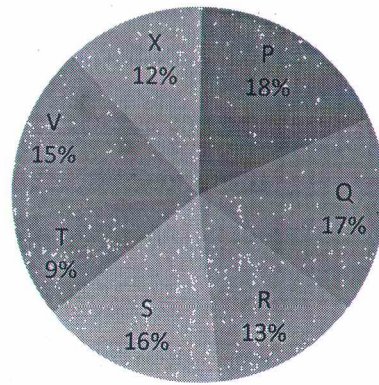
(16)

2 Study the following pie chart carefully and answer the questions given below:

Distribution of candidates enrolled for M.B.A Entrance Examination and those who passed in different institutes : P, Q, R, S, T, V, and X

Candidates enrolled = 8550

Candidates who passed : 5700



- (A) What percentage of candidates passed the exam from the institute T out of the total number of candidates enrolled from the same institute ?
- (B) What is the ratio of the candidates passed to the candidates enrolled from institutes P?
- (C) What is the percentage of candidates passed to the candidates enrolled for institutes Q and R together ?
- (D) Which institutes has the highest percentage of the candidates passed to the candidates enrolled? (16)

Section- B

3 a) Find the odd man out: 253, 136, 352, 460, 324, 631, 244

b) Insert the missing number : 71, 76, 69, 74, 67, 72, __

[8,8]

4 a) Choose that set of numbers from the given alternative sets, that is similar to given set :

Given set : (14,23,32)

(i) (15,23,31) (ii) (14,19,24) (iii) (13,21,29) (iv) (12,21,30)

b) Choose the best alternative : CLOSE : DNRWJ :: OPEN : ?

(i) PRHR (ii) PRJQ (iii) RPJB (iv) RZWR

[8,8]

Section-C

5 a) Is 52563744 divisible by 24 ? Justify your answer

b) Find the LCM of 16,24, 36 and 54

[8,8]

6 a) what was the day of the week on 15th August ,1947

b) A girl introduced a boy as the son of the daughter of the father of her uncle. Then how is boy related to a girl?

[8,8]

Section- D

7 a) Find the average of first 60 natural numbers

b) If 20% of x is 40% of y , then find x:y

[8,8]

8 a) If C.P. is Rs.2272 and S.P. is Rs. 2516, find the percentage Profit.

b) Find the simple interest on Rs. 68000 at $16\frac{2}{3}\%$ per annum for 9 months.

[8,8]

Lib 19/12/25/KMV-1 (MOR)

Exam Code: 508303
(80)

Paper Code: 3231

Programme: Master of Commerce (FYIP)
Semester-III

Course Title: Corporate Accounting

Course Code: FCOM-3095 ✓

Time Allowed: 3 Hours

Max Marks: 50

Note: Students are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. Each question carries 10 marks. Non-scientific calculator is allowed.

SECTION - A

1. Explain the procedure for issue of shares, including application, allotment, and calls along with its accounting treatment.
2. The following is the Balance Sheet of Sultan Limited as at 31st March, 2025.

Particulars	Note No.	Amount (Rs.)
I. EQUITY AND LIABILITIES		
(1) Shareholders' Funds		
(a) Share Capital:		
1,000 Equity Shares of Rs.100 each		1,00,000
8,000 Preference Shares of Rs.10 each @ Rs.8 paid-up		64,000
(b) Reserves and Surplus		
Securities Premium		3,000
Statement of Profit and Loss		10,000
General Reserve		40,000
Capital Reserve		50,000
(2) Current Liabilities		
(a) Trade Payables:		
Sundry Creditors		93,000
TOTAL		3,60,000
II. ASSETS		
(1) Non-current Assets		
(a) (i) Property, Plant and Equipment:		
Building		1,60,000
(ii) Intangible Assets:		
Patents		1,00,000
(b) Non-current investments		40,000
Investment		
(2) Current Assets		
(a) Cash and Cash Equivalents:		
Bank Balance		60,000
TOTAL		3,60,000

The company decided to redeem the preference shares at a premium of 5%. In order to finance the redemption, the company sold all its investment for Rs. 42,000. The preference shares are duly redeemed partly out of available funds (profits) and partly out of fresh issue of equity shares of Rs. 100 each at per. Pass Journal entries and prepare Balance Sheet after redemption.

SECTION - B

3. Discuss the various methods of redeeming debentures in detail.
4. The following is the trial balance of P.K. Limited as at 31st March, 2025.

Debit Items	Rs.	Credit Items	Rs.
(1) Opening Stock-in-trade	1,50,000	(15) Equity share capital	5,00,000
(2) Purchases	3,82,000	(16) Purchase return	10,000
(3) Wages	60,000	(17) Sales	11,50,000
(4) Furniture	25,000	(18) Discount	6,300
(5) Salaries	12,000	(19) Surplus in Statement of Profit and Loss (Cr. Balance)	1,70,000
(6) Rent	15,000	(20) Trade creditors	33,700
(7) Trade expenses	11,000	(21) General reserve	82,000
(8) Trade debtors	54,000	(22) Provision for doubtful debts	3,000
(9) Plant and machinery	12,00,000	(23) Bills payable	13,000
(10) Cash at bank	21,500		
(11) Computer software	9,000		
(12) Bills receivable	14,000		
(13) Bad debts	6,500		
(14) Discount allowed	8,000		
TOTAL	19,08,000	TOTAL	19,08,000

Additional Information:

- (1) Stock-in-trade on 31st March, 2025 Rs.2,00,000.
 - (2) Depreciate plant and machinery at 12%, furniture at 10% and computer software at 20%.
 - (3) Further bad debts amounted to Rs.4,000. Provide 5% on debtors for bad debts.
 - (4) Provide for income tax @ 35%.
 - (5) The Board of Directors recommended a dividend of 25% after the balance sheet date.
 - (6) Equity share capital comprises of 50,000 equity shares of Rs. 10 each, fully paid up. Authorised share capital consists of 60,000 equity shares of Rs. 10 each.
- Prepare statement of Profit and Loss for the year ended 31st March, 2025, Balance Sheet as at 31st March, 2025 and Notes to Accounts.

SECTION – C

5. Describe the procedure for realizing assets and paying liabilities during the liquidation of a company. Explain the accounting treatment and preparation of the Liquidator's Final Statement of Account at the time of company liquidation.
6. Exe Limited is absorbed by Wye Limited. Given below are the balance sheets of two companies as on 31st March 2025.

ASSETS	Exe Ltd. (Rs.)	Wye Ltd. (Rs.)
Sundry assets	16,85,000	43,57,500
Cash in hand	3,500	27,500
Total Assets	16,88,500	43,85,000
LIABILITIES		
Authorised share capital		
9,000 Equity shares of Rs.150 each	13,50,000	
60,000 Equity shares of Rs.75 each		45,00,000
Paid up Share Capital		
9,000 Equity shares—Rs.135 paid up	12,15,000	
40,000 Equity shares—Rs.75 paid up		30,00,000
General Reserve	4,03,500	1,28,500
Profit and Loss	15,000	35,000
Sundry Creditors	55,000	65,000
Total Liabilities	16,88,500	43,85,000

The holder of every three shares in Exe Limited was to receive five shares in Wye Ltd. Pass the necessary journal entries in the books of both the companies and prepare the balance sheet of Wye Ltd. after absorption. The amalgamation is in the nature of merger.

SECTION - D

7. Give format of Profit and Loss Account of Banking Companies and schedules forming a part of that.
8. Prepare Revenue Account, Profit and Loss Account and Balance Sheet of a general Insurance company with imaginary figures.

(For Reappear Candidates (Old syllabus (2024-25)))

Exam Code: 508303

Paper Code: 9342

Programme: Master of Commerce Under Five Year Integrated Programme (FYIP)

Semester: III

Course Title: Corporate Accounting

Course Code: FCOM-3096 ✓

Time allowed: 3 Hours

Max Marks: 50

Note: Attempt five questions in all, selecting atleast one question from each section. The fifth question can be attempted from any section. Each question carries 10 marks. Non-scientific calculator is allowed.

SECTION - A

Q1. Explain the provisions of Sec 55 for redemption of preference shares along with its accounting treatment. (10)

Q2. A company issued 40,000 equity shares of ₹ 50 each at a premium of 10%. The amount payable was as follows:

On Application	₹ 10
On Allotment	₹ 20
On First Call	₹ 10
On Final Call	₹ 15

Rohan holding 70 shares did not pay final call money. His shares were forfeited. These shares were reissued to Raghu at ₹ 75 per share.

Pass journal entries to record the above transactions. (10)

SECTION - B

Q3. What is a **debenture**? Explain its meaning, features, and types in detail. (10)

Q4. The following is the Trial Balance of ABC Company Ltd. as on 31st March, 2024. Prepare Profit and Loss Statement in the form prescribed under the Companies Act, 2013.

Particulars	Dr. (₹)	Particulars	Cr. (₹)
(1) Calls-in-arrears	6,400	(21) Authorised Capital 50,000 shares of ₹ 10 each	
(2) Land	10,000	(22) 10,000 shares of ₹ 10 each	1,00,000
(3) Building	25,000	(23) Bad debts reserve	1,400
(4) Furniture & fixtures	15,000	(24) Sales	80,000
(5) Carriage inward	2,300	(25) Purchases returns	3,400
(6) Wages	21,400	(26) Sundry creditors	13,200
(7) Salaries	4,600	(27) Security premium reserve	6,000
(8) Plant and machinery	3,200	(28) General reserve	24,000
(9) Cash charges	100		
(10) Gas and water	700		
(11) Rates & taxes	800		
(12) Purchases	50,000		

(13) Bills receivable	1,200		
(14) Sales Return	1,700		
(15) General expenses	1,900		
(16) Sundry debtors	42,800		
(17) Stock on 1 April 2015	25,000		
(18) Insurance	400		
(19) Cash at bank	13,000		
(20) Cash in hand	2,500		
Total	2,28,000	Total	2,28,000

Charge depreciation on building at 2.5 %, plant and machinery at 10%, and furniture and fixtures at 10%. Make provision for bad debts 5% of debtors, carry forward the insurance premium of ₹ 120. Wages of ₹ 3,200, salaries of ₹ 5,00 and rent, rates, and taxes of ₹ 200 are outstanding for payment. The stock of ₹ 30,000 was lying in the godown on 31st March, 2024.

(10)

SECTION – C

Q5. Explain the various types of amalgamation in detail. What are the different methods of calculating purchase consideration?

(10)

Q6. A company went into voluntary liquidation on **31st March, 2024**, when its balance sheet was as follows:

Liabilities	Rs	Assets	Rs
Share Capital – 2,000 shares of Rs 100 each	2,00,000	Freehold Property	1,50,000
Debentures	50,000	Machinery	60,000
Creditors	70,000	Stock	30,000
		Debtors	20,000
		Cash	60,000
Total	3,20,000	Total	3,20,000

The **debentures** were secured by a *floating charge* on all assets.

The assets realised as follows:

- Freehold Property — Rs 1,70,000
- Machinery — Rs 50,000
- Stock — Rs 20,000
- Debtors — Rs 15,000

The **liquidation expenses** amounted to Rs 2,000, and the **liquidator was entitled to remuneration of:**

- 3 % on assets realised (except cash), and
- 2 % on the amount distributed to unsecured creditors.

Prepare the Liquidator's Final Statement of Account.

(10)

SECTION – D

Q7. Give the format of the Profit and Loss Account of Banking Companies and the schedules forming a part of that.

(10)

Q8. Explain the format of the **Revenue Account and Balance Sheet of a Life Insurance Company** in detail.

(10)

Exam Code: 508305
(70)

Paper Code: 5180

Programme: Master of Commerce (FYIP)
Semester-V
Course Title: Management Accounting
Course Code: FCOL-5091

Time Allowed: 3 Hours

Max Marks: 80

Note: Attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. Each question carries 16 marks.

Section- A

1. What do you mean by Management Accounting? Differentiate between Financial Accounting and Management Accounting. (4,12)
2. Following are the Balance sheets of A Ltd as at 31.03.2021 and 2020. Prepare a Comparative Balance Sheet and Study the Financial Position of A Ltd. (16)

Particular	31-03.2021 (Rs. in Thousands)	31.03.2020 (Rs. in Thousands)
I. Equity and Liabilities:		
1. Shareholders' Funds:		
a) Share Capital	800	600
b) Reserve and Surplus	222	330
2. Non-Current Liabilities		
a) Debentures	300	200
b) Long-term Loans on Mortgage	200	150
3. Current Liabilities:		
a) Trade Payables		
Bills Payable	45	50
Sundry Creditors	120	100
b) Other Current Liabilities	10	05
Total	1697	1435
II. Assets		
1. Non-Current Assets:		
Fixed Assets (Tangible):		
Land and Building	270	370
Plant and Machinery	600	400
Furniture and Fixtures	25	20
Other Fixed Assets	30	25
2. Current Assets:		
a) Inventory (Stock)	350	250
b) Trade Receivable		
Bills Receivables	90	150
S. Debtors	250	200
c) Cash in hand and at Bank	80	20
d) Other Current Assets (Prepaid Exp.)	2	-
Total	1697	1435

Section- B

3. The following information is given about M/s S.P. Ltd. For the year ending March 31, 2021:

1.	Inventory turnover ratio	6 times
2.	GP Ratio	20% on Sales or (revenue)
3.	Revenue (Sales) for the year ended 31-3-2021	₹ 3,00,000/-
4.	Closing Inventory Rs. 10,000 more than opening inventory	
5.	Opening Trade Payables	₹ 20,000/-
6.	Closing Trade Payables	₹ 30,000/-
7.	Trade Receivables at the end	₹ 60,000/-
8.	Net Working Capital	₹ 50,000/-

Find Out:

Average Inventory	Average Payment Period
Purchases	Average Collection Period
Payables Turnover Ratio	Working Capital Turnover Ratio

(16)

4. From the following Balance sheet of Cuttack Ltd., Prepare a Schedule of Change in Working Capital and a Fund Flow Statement:

Particulars	31.03.2021 (₹)	31.03.2021 (₹)
I. Equity and Liabilities:		
Shareholders' Funds:		
Equity Share Capital	4,00,000	3,00,000
Reserve and Surplus:		
General Reserve	70,000	40,000
Profit and Loss Balance	48,000	30,000
Non-Current Liabilities		
12% Debentures	1,00,000	1,50,000
Current Liabilities:		
Trade Payables		60,000
-Creditors	80,000	15,000
-Bills Payable	19,000	
Total	7,17,000	5,95,000
II. Assets		
Non-Current Assets:		
Fixed Assets (Tangible):		
Buildings	1,20,000	1,60,000
Plant and Machinery	2,00,000	80,000
Intangible Assets		
Goodwill	40,000	72,000
Current Assets:		
Debtors	2,85,000	2,20,000
Bills Receivable	24,000	18,000
Inventories (Stock)	30,000	20,000
Cash and Bank	18,000	25,000
Total	7,17,000	5,95,000

Depreciation Charged on Plant and Machinery was? ₹ 20,000 and on Building ₹ 40,000

(16)

Section- C

5. "Marginal Costing is essentially a technique of Cost Analysis and Cost Presentation" Discuss the statement with reference to the applications, merits and demerits of marginal costing. (6,5,5)
6. The following data are available from the records of a company:

You are required to:

	₹
Sales	60,000
Variable Cost	30,000
Fixed Cost	15,000

1. Calculate the P/V Ratio, Break Even and Margin of Safety at this level.
2. Calculate the effect of 10% increase in sale price.
3. Calculate the effect of 10% decrease in sale price. (16)

Section- D

7. Explain Transfer pricing and various methods of Transfer pricing? (16)
8. What do you mean by Responsibility Accounting? Briefly explain various Responsibility centres? (8,8)

Exam Code: 508305

Paper Code: 5181

Programme: Master of Commerce (FYIP) Semester V

Course Title: Income Tax

Course Code: FCOL-5092 ✓

Time Allowed: 3 Hours

Max Marks: 80

Note: Attempt five questions in all, selecting atleast one question from each section. Fifth question may be attempted from any section. Each question carries 16 marks. Simple calculator is allowed.

SECTION A

1. Define Income Tax as per the Income Tax Act, 1961. Discuss its nature and scope. (16 marks)
2. How is the residential status of an individual determined for computing his tax liability? Explain the incidence of residence on tax liability. (16 marks)

SECTION B

3. Explain the Provisions relating to Business and profession in detail. (16 marks)
4. From the following information compute taxable income from salaries of Mr. Ramesh for the assessment year 2025-26
 - I. Basic Salary ₹ 50,000 p.m.
 - II. Dearness allowance 30% of basic salary.
 - III. Telephone allowance ₹ 500 p.m.
 - IV. Medical insurance premium paid by the employer on the health of employee ₹ 4000.
 - V. Employer provided the facility of laptop costing ₹ 60,000 and computer costing ₹ 40,000 for personal use.
 - VI. Salary of house-keeper reimbursed by employer ₹ 24,000.

VII. Mr. Ramesh paid employment tax ₹ 2,000.

(16 marks)

SECTION C

5. Describe any ten items of incomes which can be included under the head "Income from other sources". (16 marks)
6. Mr. A is the owner of a house at Agra, particulars in respect of which for the year ended 31st March, 2025 are as below:

S.No.	Particulars	Amount (₹)
1.	Actual rent received	4,500
2.	Municipal Valuation	4,200
3.	Total Municipal tax	630
4.	Municipal tax paid by Mr. A	420
5.	Municipal tax paid by the tenant	210
6.	Interest on loan is taken for renewing the house	150
7.	Unrealised rent allowed in the Assessment Year 2021-22 recovered during the year	2,000

Compute Mr. A's Income from House Property for the Assessment Year 2025-26. (16 marks)

SECTION D

7. Discuss the major deductions an individual can claim from taxable income under the Income Tax Act. (16 marks)
8. What do you mean by Deduction of Tax at Source? Discuss in detail. (16 marks)

Exam Code: 508305
(70)

Paper Code: 5182

Programme: Master of Commerce (FYIP)
Semester-V

Course Title: Operations Research

Course Code: FCOL-5093

Time Allowed: 3 Hours

Max Marks: 80

Note: Attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 16 marks.

SECTION-A

1. What is Operations Research? Briefly explain its methodology and techniques. (4,6,6)
2. Solve the following LPP
Maximise $Z = 20X_1 + 10X_2$
Subject to :
 $X_1 + X_2 = 150$
 $X_1 \leq 40$
 $X_2 \geq 20$ Where $x_1, x_2 \geq 0$ (16)

SECTION-B

3. A manufacturer must produce a product in sufficient quantity to meet contractual sales in next four months. The production capacity and unit cost of production vary from month to month. The product produces in

one month may be held for sale in later months but at an estimated storage cost of Rs. 1 per month. No storage cost is incurred for goods sold in the same month in which they are produced. There is no opening inventory and none is desired at the end of four months. The necessary details are given in the following table:

Months	Contracted Sales	Maximum Production	Unit Cost of Production
1	20	40	14
2	30	50	16
3	50	30	15
4	40	50	17

How should the manufacturer produce each month to minimize the total cost? (16)

4. ABC has five plants each of which can manufacture any of the five products. Production costs and sales revenue differ from plant to plant. Which plant should produce which product so as to maximize the profits.

Sales Revenue (Rs.)

Product

Plant	Product				
	1	2	3	4	5
A	65	78	83	60	95
B	85	52	59	44	73
C	83	56	69	64	78
D	49	80	85	84	73
E	59	68	83	74	83

	Production Cost (Rs.)				
	Product				
Plant	1	2	3	4	5
A	33	40	43	32	45
B	45	28	31	23	37
C	42	29	36	29	41
D	27	42	44	38	37
E	30	35	43	39	44

(16)

SECTION-C

5. Solve the following Sequencing problem:

Tasks	Machine I	Machine II	Machine III
A	3	4	6
B	8	3	7
C	7	2	5
D	4	5	11
E	9	1	5
F	8	4	6
G	7	3	12

(16)

6. Solve the following game :

A \ B	1	2	3	4	5
1	-5	5	0	-1	8
2	8	-4	-1	6	-5

(16)

SECTION D

7. What is Queuing Theory? Explain the MMI Model of Queuing Theory. (6,10)
8. The following are the activity timings in a project network:

Activity	Optimistic Time	Pessimistic Time	Most Likely Time
1-2	1	7	1
1-3	1	7	4
1-4	2	8	2
2-5	1	1	1
3-5	2	14	5
4-6	2	8	5
5-6	3	15	6

- (i) Draw the network diagram.
- (ii) Find the expected project completion time.
- (iii) Calculate the floats of the activities.
- (iv) What is the probability of completing the project
- 4 weeks later than the expected time.
 - 4 weeks earlier than the expected time
- (4,4,4,4)

Exam Code: 508305
(70)

Paper Code: 5183

Programme: Master of Commerce (FYIP)
Semester-V

Course Title: Financial Management

Course Code: FCOL-5094

Time Allowed: 3 Hours

Max Marks: 80

Note: Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries equal (16) marks.

Section A

1. (a) "A rational human being has a time preference for money". What are the reasons for such a preference?
(b) A company is proposing to issue a 5 year debenture of Rs. 1,000 redeemable in equal instalments at 14% rate of interest per annum. If an investor has a minimum required rate of return of 12%, calculate the debenture's present value for him. What should he be willing to pay now to purchase the debenture?
2. What is the relationship between risk and return? How can risk of an asset be measured? Also explain different types of risk?

Section B

3. What do you understand by capital budgeting process? Explain different methods of capital budgeting under risk and uncertainty.
4. M/s Albert & co. has the following capital structure as on 31st December, 2020:

	Rs.
10% Debentures	3,00,000
9% Preference Shares	2,00,000
Equity- 5,000 of Rs. 100 each	5,00,000,
Total	10,00,000

The equity shares of the company are quoted at Rs. 102 and the company is expected to declare a dividend of Rs. 9 per share for 2020. The company has registered a dividend growth rate of 5% which is expected to be maintained.

(i) Assuming the tax rate applicable to the company at 50%, calculate the weighted average cost of capital. State your assumptions, if any.

(ii) Assuming, in the above problem, that the company can raise additional term loan at 12% for Rs. 5,00,000 to finance an expansion, calculate the revised weighted cost of capital. The company's assessment is that it will be in a position to increase the dividend from Rs. 9 per share to Rs. 10 per share, but the business risk associated with new financing may bring down the market price from Rs. 102 to Rs. 96 per share.

Section C

5. Companies X and Y are identical in all respects including risk factors except for debt/equity, X having issued 10% debentures of Rs. 10 lakhs while Y has issued only equity. Both the companies earn 20% before interest and taxes on their total assets of Rs. 30 lakhs. Assuming a tax rate of 50% and capitalisation rate of 15% for an all-equity company, compute the value of companies X and Y using
- Net income approach
 - Net operating income approach.
6. Discuss various types of dividends. Enlist the determinants of dividend policy of a firm.

Section D

7. From the following information, prepare a statement showing the working capital requirements:

Budgeted Sales	Rs. 2,60,000 per annum
Analysis of one rupee of sales:	Rs.
Raw material	0.30
Direct Labour	0.40
Overheads	0.20
Total Cost	0.90
Profit	0.10
Sales	1.00

It is estimated that:

- Raw materials are carried in stock for 3 weeks and finished goods for 2 weeks.

- 2) Factory processing will take 3 weeks and it may be assumed to be consisting of 100% of raw materials, Wages and overheads.
 - 3) Suppliers will give 5 weeks' credit.
 - 4) Customers will require 8 weeks' credit.
8. What do you mean by cash management? Discuss Baumol and Miller Orr models of cash management.

Exam Code: 508305
(70)

Paper Code: 5184

Programme: Master of Commerce (FYIP)
Semester-V

Course Title: Human Resource Management

Course Code: FCOL-5095

Time Allowed: 3 Hours

Max Marks: 80

Note: Attempt 5 questions, selecting at least 1 question from each section. The fifth question may be attempted from any section. Each question carries equal (16) marks.

Section-A

1. Define Human Resource Management. Explain the functions of HRM in detail.
2. Discuss the process of Human Resource Planning.

Section-B

3. Explain the methods and problems of Job Analysis.
4. Difference between Recruitment and Selection? Explain the sources and techniques of Recruitment.

Section-C

5. Explain the need and process of Training and Development Programme.

6. Discuss the strategy and designing of training and development and explain the levels of training evaluation.

Section-D

7. Explain factors and challenges of employee remuneration.
8. Discuss the methods and techniques of Performance Appraisal.

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Exam Code: 508305

Paper Code: 5185

Programme: Master of Commerce (FYIP)

Semester: V

Course Title: Production and Operations Management

Course Code: FCOL-5096

Time: 03 Hours

Maximum Marks: 80

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 16 marks.

Section -A

- Q1. What do you understand by Production and Operations Management? Discuss in detail its objectives and functions.
Q2. What is Scheduling? Discuss various methods of Scheduling.

Section -B

- Q3. Explain the term 'Productivity' and discuss various methods to improve productivity.
Q4. What is work measurement? What are its objectives?

Section -C

- Q5. What is a Total Quality Management? Discuss various principles of Total Quality Management.
Q6. Explain the concept and various costs related to Inventory.

Section -D

- Q7. What are the various components of Supply Chain Management?
Q8. Discuss in detail the various models for Inventory Control.

Exam Code: 508401
(20)

Paper Code: 1199

Programme: Master of Science (Mathematics) (FYIP)
Semester-I

Course Title: Calculus

Course Code: FMAL-1333

Time Allowed: 3 Hours

Max Marks: 70

Note:- Attempt five questions, selecting at least one question from each section. The Fifth question may be attempted from any section. Each question carries 14 marks.

Section-A

1. (a) Using definition of limit, prove that $\lim_{x \rightarrow 0} (5x - 3) = 7$

04

(b) Determine the value of constants a and b so that the function

$$f(x) = \begin{cases} 1, & x \leq 3 \\ ax + b, & 3 < x < 5 \\ 7, & 5 < x \end{cases} \text{ may be continuous for all } x.$$

05

- (c) Show that $\lim_{x \rightarrow 0} \left(\frac{x^2 \sin \frac{1}{x}}{\tan x} \right)$ exists, but cannot be evaluated by L' Hospital Rule. What is the limit? 05
2. (a) Evaluate $\lim_{x \rightarrow 0} (\sin x)^{\tan x}$. 04
- (b) State and prove Leibnitz Theorem. 06
- (c) If $y = \sin (\log x)$, show that
 $x^2 y_2 + x y_1 + y = 0$ 04

Section-B

3. (a) Find the intervals of increase and decrease for the function $f(x) = 3x^4 + 4x^3 - 12x^2 + 2$ 04
- (b) Show that the function $f(x) = |x|$ is differentiable for all real numbers except at $x = 0$. 05
- (c) Find the shortest distance from a given point $(0, b)$ on the y-axis to the parabola $x^2 = 4y$, where b is a real number. 05
4. (a) Use Maclaurin's Theorem with Lagrange's form of remainder to expand $\sin x$ as far as the n th term in terms of ascending powers of x . 07
- (b) State and prove Taylor's Theorem with Cauchy's form of remainder. 07

Section-C

5. (a) Define concavity of a curve. 02
 (b) Find the values of x for which the curve $y = x + 2 \sin x$, over the interval $[0, 2\pi]$ Concave upwards or downwards. Also determine the points of inflexion. 06
 (c) Show that the points of inflexion of the curve $y^2 = (x - a)^2(x - b)$ lies on the line $3x + a = 4b$. 06
6. (a) Find all the asymptotes of the curve $x^3 - x^2y - xy^2 + y^3 + 2x^2 - 4y^2 + 2xy + x + y + 1 = 0$ 07
 (b) Show that the points of intersection of the curve $xy(x^2 - y^2) - 25x^2 - 9y^2 + 144 = 0$ and its asymptotes lie on ellipse whose eccentricity is $\frac{4}{5}$. 07

Section-D

7. (a) Evaluate $\int_0^{\frac{\pi}{2}} \log \cos x \, dx$ using properties of definite integral. 05
 (b) Show that $\int_0^{2a} f(x) \, dx = \int_0^a f(x) \, dx + \int_0^a f(2a - x) \, dx$ 03
 (c) Obtain the reduction formula for $\int \sec^n x \, dx$. Hence evaluate $\int \sec^5 x \, dx$. 06

8. (a) Define Riemann sums. 02
- (b) Find the length of arc of parabola $y^2 = 4ax$ cut off by the line $3y = 8x$. 06
- (c) Using integration, find the area of the region bounded by triangle whose vertices are $(-1,1)$, $(0,5)$ and $(3,2)$ 06

Exam Code: 508401

Paper Code: 1200

Programme: Master of Science (Mathematics) (FYIP)

Semester-I

Course Title: Theory of Equations

Course Code: FMAL-1334

Time Allowed: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

Section-A

1(a). Find the g.c.d. of $f(x)$, $g(x)$ over $\mathbb{Q}$ by Euclidean algorithm where $f(x) = x^4 + 3x^3 + 2x^2 + x + 1$ and $g(x) = x^3 + x^2 + x + 1$. (7)

(b). Solve the equation $x^4 - 9x^2 + 4x + 12 = 0$, by testing for equal roots. (7)

2. State and Prove Euclidean Algorithm for polynomials. (14)

Section-B

3(a). Solve the equation $x^3 - 3x^2 - 3x + 1 = 0$ given that reciprocal of roots of the equation are also the roots. (7)

(b). Show that the equation $x^{11} - x^6 + 4x^5 - 5 = 0$ has at least 8 non real roots. Can a real root of equation be negative? Justify. (7)

4(a). Find the rational roots of the equation
 $2x^3 - 19x^2 + 59x - 60 = 0.$ (7)

(b). If α, β, γ are the roots of $3x^3 + 6x^2 - 9x + 2 = 0$,
 find the value of $\sum \frac{\alpha}{\beta}.$ (7)

Section-C

5(a). Reduce the equation $2x^3 - 3x^2 + 10x - 4 = 0$ to the
 form $z^3 + 3Hz + G = 0$ where H and G are the
 constants. (7)

(b). Use Cardan's method to solve $28x^3 - 9x^2 + 1 = 0.$ (7)

6(a). Solve the reciprocal equation
 $x^4 - 10x^3 + 26x^2 - 10x + 1 = 0.$ (7)

(b). If $x + y + z = 6, x^2 + y^2 + z^2 = 14, x^3 + y^3 + z^3 = 36$,
 form an equation whose roots are x,y,z. Hence or
 otherwise find the value of $x^4 + y^4 + z^4.$ (7)

Section-D

7. State and Prove Newton's theorem on the sum of powers
 of roots. (14)

8(a). By method of grouping, show that the real root of the
 equation $x^4 - 10x^3 - 13x^2 + 60x + 65 = 0$ lie
 between -4 and 12. (7)

(b). Separate the real roots of the equation
 $x^5 - 80x + 6 = 0.$ (7)

Exam Code: 508401

Paper Code: 1201

Programme: Master of Science (Mathematics) (FYIP)

Semester- I

Course Title: Dynamics

Course Code: FMAL-1335

Time Allowed: 3 Hours

Max Marks: 70

Note: Attempt five questions in all selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries fourteen marks.

Section- A

- 1(a) Two cars start off the race with velocities u and v and travel in a straight line with uniform acceleration α and β ; if the race ends in a dead heat, prove that the length of the course is $\frac{2(u-v)(u\beta - v\alpha)}{(\alpha - \beta)^2}$. (7)
- (b) A mass m kg is acted upon by a constant force P kg wt. under which in t seconds it moves a distance x meters and acquires a velocity v m/sec from rest. Show that $x = \frac{gt^2P}{2m} = \frac{v^2m}{2gP}$. (7)
- 2(a) Two scale pans each of mass 4 kg. are connected by a light string passing over a pulley. Show how to divide a mass of 10 kg. in two scale pans so as to produce an acceleration of $\frac{g}{9}$. (7)
- (b) A particle of mass 0.2 kg. lies on a smooth table at a distance of 6 metres from the edge of the table. It is connected to a mass of 0.4 kg. by a light string which passes over a pulley fixed at the edge of the table. The mass of 0.4 kg is hanging vertically. If the system starts from rest, how long will it take the 0.2 kg. mass to reach the edge of the table. (7)

Section- B

- 3(a) A particle moving in a straight line is subjected to resistance which produces retardation kv^3 . Show that v and t are given in terms of s by the equations: $v = \frac{u}{1+ksu}$, $t = \frac{1}{2}ks^2 + \frac{s}{u}$ and $v^2 = \frac{u^2}{1+2ktu^2}$
Where u is initial velocity and the particle starts from origin. (7)

- (b) A particle moving with S.H.M. of period 12 seconds, travels to 10 cm from the position of rest in 2 seconds. Find the amplitude, the maximum velocity and the velocity at the end of 2 seconds. (7)
- 4(a) A particle m is attached to a light wire which is stretched tightly between two fixed points under tension T . If a, b be the distances of the particle from the two ends, prove that the period of transverse oscillation is $2\pi \sqrt{\frac{mab}{T(a+b)}}$. (7)
- (b) A body moves down a smooth inclined plane under the action of gravity alone, Discuss its motion. (7)

Section- C

- 5(a) A particle moves in a plane so that, its position at any time t is given by $x = 10t^2 + 2t + 1$, $y = t^3 - 3$ where x, y are measured in metres and t in seconds. Find the velocity and acceleration of the particle at time $t = 3$ seconds. (7)
- (b) A boy can throw a cricket ball 100 m. How long is the ball in the air and what height does it attain? (7)
- 6(a) A particle of mass 10 gms is attached to a string of length 40 cm and revolves as conical pendulum making 15 revolutions per minute. Find the tension developed in the string. (7)
- (b) A clock with a second's pendulum loses 20 seconds per day at a place where acceleration due to gravity is 9.8 m/sec^2 . Find what change is necessary to make it accurate in (i) length (ii) gravity. (7)

Section- D

- 7(a) A particle of mass m is moving with S.H.M. of period T and amplitude a . Find the work done by the force of attraction when the particle moves from the mean position to an extreme position. (7)
- (b) A particle of mass m falls from rest at a height ' h ' above the ground. Show that the sum of kinetic and potential energies is constant throughout the motion. (7)
- 8(a) An engine working at the rate of H units is pulling a train up an incline of 1 in n at a steady of $v \text{ m/sec}$. If M is the total mass of the train, find the average frictional force. (7)
- (b) Define work, power and energy and discuss its units. (7)

Exam Code: 508401

Paper Code: 1203

Programme: Master of Science (Mathematics) (FYIP)

Semester-I

Course Title: Programming Language –I

Course Code: FMAM-1130

Time Allowed: 3 Hours

Max. Marks: 40

Note: Attempt five questions in all, selecting at least one from each section. Fifth question may be attempted from any section. Each question carries 8 marks.

SECTION - A

- Q.1 Define an Algorithm. What are the characteristics of a good algorithm? (8)
- Q.2 Compare and Contrast the use of flowcharts, algorithms, decision tables and pseudo code in the program design process. (8)

SECTION - B

- Q.3 What are the standard Input/Output functions in C? Explain the use of scanf() and printf(). (8)
- Q.4 What are Expressions? How expressions are formed? Discuss various types of operators in C with suitable examples. (8)

SECTION - C

- Q.5 What is dynamic memory allocation in C? Explain the use of malloc(), calloc(), realloc(), and free() with examples and when to use these functions. (8)
- Q.6 What is Recursion in C Programming? What are the advantages and disadvantages of using recursions? (8)

SECTION - D

- Q.7 What is String handling in C? How strings are represented in memory? Explain the purpose of the strcpy() and strcat() functions in string manipulation. (8)
- Q.8 What according to you are the best searching and sorting techniques, justify your answer and discuss the complexity also? (8)

Exam Code: 508401

Paper Code: 1202

Programme: Master of Science (Mathematics) (FYIP)

Semester-I

Course Title: Mechanics-I

Course Code: FMAM-1395

Time Allowed: 3 Hours

Max. Marks: 40

Note: Attempt five questions in all, selecting at least one from each section. Fifth question may be attempted from any section. Each question carries 8 marks. Students can use Non-Scientific calculator or logarithmic table.

Section A

1. Find the expression for displacement, velocity and acceleration of a particle in spherical polar coordinates. (8)
2. (a) Discuss the motion of a system with variable mass and find the expression for velocity and acceleration of a rocket whose mass is decreasing with time. Also find the burnt out speed. (6)
(b) If Cartesian coordinates of a point are $(2, -1, 4)$ and find spherical polar coordinates of a point. (2)

Section B

3. Find relationships between recoiling angles of LAB and center of mass systems for two-dimensional elastic scattering. (8)

4. Derive Euler's equations for the rotational motion of a rigid body. (8)

Section C

5. (a) State and prove Kepler's third law of planetary motion. (6)
 (b) A body moving under action of a central force describes a path $r = a \cos \theta$. Find the nature of force law. (2)
6. Derive the equation of orbit of a body under inverse square force field. Define turning points and discuss the nature of orbits on the basis of total energy of body. (8)

Section D

7. (a) Find the Coriolis force on a 0.2 kg mass moving at 150 m/s due north at 30° latitude. (2)
 (b) Find expressions for horizontal and vertical accelerations on a particle moving on surface of earth at latitude λ in northern hemisphere due to rotation of earth. (6)
8. (a) What are Galilean transformations? Find their relations and prove that the laws of conservation of energy and linear momentum remain invariant under Galilean transformations? (6)
 (b) Explain the formation of cyclones and trade winds? (2)

Exam Code: 508403

Paper Code: 3198

Programme: Master of Science (Mathematics) (FYIP)

Semester-III

Course Title: Graph Theory

Course Code: FMAL-3330

Time Allowed: 3 Hours

Max. Marks: 70

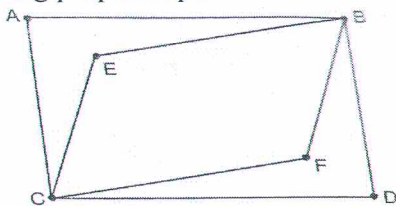
Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

Section-A

- Q.1 (a) Justify how many vertices are necessary to construct a 3 regular graph with exactly 6 edges ? Also draw the graph. (7)
- (b) Define subgraph and homeomorphic graph with an example. Also discuss the union and intersection of two graphs with an example. (7)
- Q.2 (a) Prove or disprove that a graph G is self complementary if it has $4n$ or $4n+1$ vertices (n is a non negative integer). (7)
- (b) Define complete graph and planar graph with an example. Justify whether or not a complete graph K_5 is non planar. (7)

Section-B

- Q.3 (a) Prove or disprove that a simple graph with n vertices must be connected if it has more than $\frac{(n-1)(n-2)}{2}$ edges. (7)
- (b) Let $G=(V,E)$ be a simple connected planar graph with more than one edges and R regions, then justify whether or not the following inequality holds :
- (i) $2|E| \geq 3R$ (ii) $|E| \leq 3|V| - 6$
- (iii) There exist a vertex ' v ' of G such that $\deg(v) \leq 5$ (7)
- Q.4 (a) Define Euler and Hamiltonian Circuit. Does the graph given below has Euler or Hamilton Circuit. If yes or no, then justify your answer by giving proper steps.



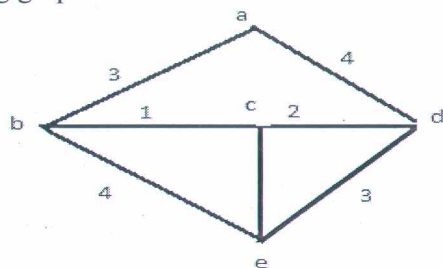
(7)

(b) Explain the Konigsberg problem with the help of Graph. (7)

Section-C

Q.5 (a) Justify whether or not that in any non-trivial tree, there are atleast two pendent vertices. (7)

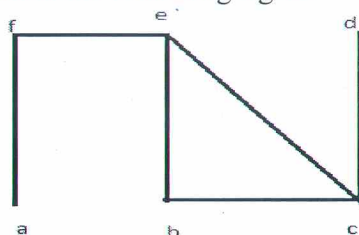
(b) Using Kruskal's algorithm, find minimal spanning tree for the following graph :



(7)

Q.6 (a) Define m-ary tree with an example. Represent the expression as a binary tree and write the prefix and post fix forms of the expression $((a + b) \uparrow 5) + ((a - b) / 2)$. (7)

(b) Define spanning tree with an example. Find all spanning trees of the graph shown in the following figure:



(7)

Section-D

Q.7 (a) Prove or disprove that chromatic number of $K_{m,n}$ is 2. (7)

(b) Justify whether or not that every planar graph is five colourable. (7)

Q.8 (a) Prove or disprove that a graph G is complete graph if and only if chromatic number of G is n. (7)

(b) Draw the directed graph G whose incidence matrix is as under

$$\begin{bmatrix} 1 & 0 & 0 & -1 & 1 \\ -1 & 1 & 0 & 0 & 0 \\ 0 & -1 & 1 & 0 & -1 \\ 0 & 0 & -1 & 1 & 0 \end{bmatrix}. \quad (7)$$

Exam Code: 508403

Paper Code: 3194

Programme: Master of Science (Mathematics) (FYIP)

Semester – III

Course Title: Theory of Real Functions

Course Code: FMAL-3331 ✓

Time Allowed: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

SECTION-A

1. (a) Define limit of a function. If $\lim_{x \rightarrow a} f(x) = l$ and $\lim_{x \rightarrow a} g(x) = l$ then prove that $\lim_{x \rightarrow a} (fg)(x) = lm$. 7

- (b) Using $\epsilon - \delta$ definition of limit, prove that $\lim_{x \rightarrow 2} (5x - 3) = 7$. 7

2. (a) Let $f(x) = \begin{cases} 1 & ; x \leq 3 \\ ax + b & ; 3 < x < 5 \\ 7 & ; 5 \leq x \end{cases}$. Determine the constants a and b so that $f(x)$ may be continuous for all x . 8

- b) State discontinuity criterion. Explain the types of discontinuity. 6

SECTION-B

3. (a) Let $f(x) = \begin{cases} 2x + 1 & ; 0 \leq x \leq 1 \\ 2 + x & ; 1 < x \leq 5 \end{cases}$ and $g(x) = \begin{cases} x^2 & ; 0 \leq x \leq 1 \\ 3x - 1 & ; 3 < x \leq 5 \end{cases}$. Find all points of discontinuity of $g \circ f$ in $[0, 2]$. 7

- (b) Prove that $f(x) = x^3 + 1$ is uniformly continuous in $[0, 1]$. 7

4. (a) If f and g are two differentiable functions on an interval I , then prove that $f + g$ is also differentiable on the interval I , and $(f + g)' = f' + g'$ 7
- (b) Examine the differentiability of $f(x)$ at $x = 2$, where
- $$f(x) = \begin{cases} x-1 & ; x < 2 \\ 2x-3 & ; x \geq 2 \end{cases} \quad 7$$

SECTION-C

5. (a) Find the values of x for which $y = x^4 - 6x^3 + 12x^2 + 5x + 7$ is concave upwards or downwards. Also find the points of inflexion. 7
- (b) Use mean value theorem to prove that $1 + x \leq e^x \leq 1 + xe^x \quad \forall x \geq 0$ 7
6. (a) Evaluate the limit $\lim_{x \rightarrow 0} \left(\frac{\sin x}{x} \right)^{\frac{1}{x^2}}$ using L' Hospital Rule. 7
- (b) State and prove Cauchy's Mean value theorem. 7

SECTION-D

7. State and prove Taylor's theorem with Lagrange's form of remainder. Also, state Maclaurin's theorem with Lagrange's form of remainder. 14
8. (a) Expand $\sin x$ in ascending powers of $\left(x - \frac{\pi}{2}\right)$. 7
- (b) Use Maclaurin's theorem to show that
$$e^x = 1 + x + \frac{x^2}{2} + \frac{x^3}{3} + \dots + \frac{x^{n-1}}{(n-1)} + \frac{x^n}{n} e^{\theta x}; \quad 0 < \theta < 1. \quad 7$$

Exam Code: 508403

Paper Code: 3195

Programme: Master of Science (Mathematics) (FYIP)

Semester: III

Course Title: Applied Differential Equations

Course Code: FMAL-3332 ✓

Time Allowed: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all selecting atleast one question from each section. Fifth question can be attempted from any section. Each question carries 14 (7+7) marks. Students are allowed to use scientific non programmable Calculator.

Section - A

Q1. (a) What are the classifications, origin and application of Differential Equations?

(b) Show that every function f defined by $f(x) = (x^3 + c)e^{-3x}$, where c is an arbitrary constant, is a solution of the differential equation

$$\frac{dy}{dx} + 3y = 3x^2e^{-3x} \quad [7,7]$$

Q2. (a) Solve the initial value problem

$$(2y \sin x \cos x + y^2 \sin x)dx + (\sin^2 x - 2y \cos x)dy = 0, y(0) = 3$$

(b) Solve the differential equation by separating the variables

$$x \sin y dx + (x^2 + 1) \cos y dy = 0, y(1) = \pi/2 \quad [7,7]$$

SECTION - B

Q3. (a) Find the orthogonal trajectories of the family of circles which are tangent to the y axis at the origin

(b) Find a family of oblique trajectories that intersect the family of curves $x + y = cx^2$ at an angle α s.t $\tan \alpha = 2$ [7,7]

Q4. (a) Explain the limited growth Model in detail. Derive its differential equation and obtain its solution. Also sketch the graph and

describe how the population approaches the carrying capacity as time increases.

(b) Explain the process of assimilation of a single cold pill into the bloodstream. Describe each stage and represent the equation of drug concentration in blood using an exponential model and a well labelled graph.

[7,7]

SECTION-C

Q5. (a) Solve the non-homogeneous differential Equations with constant Coefficients

$$y'' - 4y' + 4y = 8(x^2 + e^{2x} + \sin 2x)$$

(b) Solve the differential Equations

$$\frac{d^4 y}{dx^4} - y = x^2 \sin x$$

[7,7]

Q6. (a) Solve the Cauchy Euler equations w.r.t initial condition

$$x^2 \frac{d^2 y}{dx^2} - 5x \frac{dy}{dx} + 8y = 2x^3, y(2)=0, y'(2)=-8$$

(b) Find the general solution of the following non-homogeneous differential equations using method of variation of parameters.

$$(D^3 - 6D^2 + 11D - 6)y = e^x$$

[7,7]

SECTION-D

Q7. (a) Solve in series

$$(2x + x^3) \frac{d^2 y}{dx^2} - \frac{dy}{dx} - 6xy = 0$$

(b) Solve Hermite Differential Equation $\frac{d^2 y}{dx^2} - 2x \frac{dy}{dx} + 2ny = 0$

[7,7]

Q8. (a) Solve in series by method of Frobenius

$$4x \frac{d^2 y}{dx^2} + 2 \frac{dy}{dx} + y = 0$$

(b) Solve Bessel Equation of order zero,

$$x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} + (x^2 - 1)y = 0$$

[7,7]

Exam Code: 508403

Paper Code: 3196

Programme: Master of Science (Mathematics) (FYIP)

Semester-III

Course Title: Logic and Reasoning

Course Code: FMAL-3333 ✓

Time: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

Section-A

Q 1 (A) Complete the given series: 4, 8, 28, 80, 244, ?

- (a) 278 (b) 428 (c) 628 (d) 728 (4)

(B) Choose the Odd pair of words.

- (a) China : Beijing (b) Russia : Moscow
(c) Japan : Singapore (d) Spain : Madrid (3)

(C) In a certain code, GLAMOUR is written as IJCNMWP and MISRULE is written as OGUSSNC, then how will TOPICAL be written in that code? (7)

Q 2 (A) Pointing out to a lady, a girl said, "She is the daughter-in-law of the grandmother of my father's only son." How is the lady related to the girl?

- (a) Sister-in-law (b) Mother (c) Aunt
(d) Mother-in-law (e) Cousin (4)

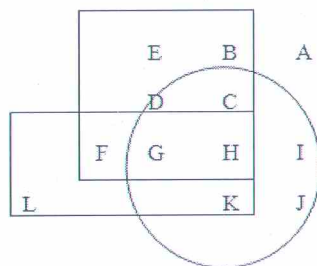
(B) Choose a number set similar to a given number set; 11: 1210

- (a) 8: 448 (b) 6: 2160 (c) 7: 1029 (d) 9: 729 (3)

(C) Identify the wrong number in the series: 69, 55, 26, 13, 5 (7)

Section-B

Q3 (A) In the following diagram, the square represents girls, circle tall persons, the triangle is for tennis players and the rectangle stands for the swimmers.



(7)

On the basis of the above diagram, answer the following questions:

- (i) Which letter represents tall girls who are swimmers but don't play tennis?
 (a) C (b) D (c) G (d) H
- (ii) Which letter represents girls who are swimmers, play tennis but are not tall?
 (a) B (b) E (c) F (d) None of These
- (iii) Which letter represents tall girls who do not play tennis and are not swimmers?
 (a) C (b) D (c) E (d) G
- (iv) Which letter represents tall persons who are gents and swimmers but do not play tennis?
 (a) I (b) J (c) K (d) L

(B) Five persons are standing in a line. One of the two persons at the extreme ends in a professor and the other a business man. An advocate is standing to the right of the student. An author is to the left of the business man. The student is standing between the professor and the advocate. Counting from the left, the advocate is at which place?

- (a) 1st (b) 2nd (c) 3rd (d) 5th (7)

Q4 (A) If the given interchanges namely: signs + and ÷ numbers 2 and 4 are made in signs and numbers, which one of the following four equations would be correct?

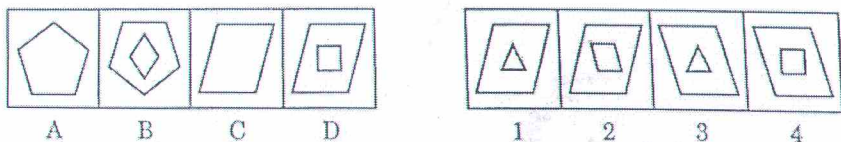
- (a) $2 + 4 \div 3 = 3$ (b) $4 + 2 \div 6 = 1.5$
 (c) $4 \div 2 + 3 = 4$ (d) $2 + 4 \div 6 = 8$ (7)

(B) If you are facing north-east and move 10m forward, turn left and move 7.5m, then you are

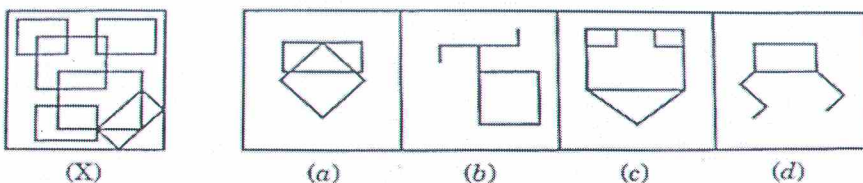
- (a) north of your initial position
 (b) south of your initial position
 (c) 12m from your initial position
 (d) east of your initial position
 (e) Both (c) and (d) (7)

Section-C

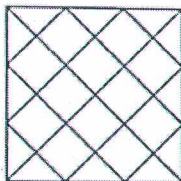
Q5 (A) Following figure consists of four figures marked as A, B, C and D which constitute the problem set followed by four other figures marked as 1, 2, 3 and 4 which constitute the answer set. Set figures A and B are related in a particular manner. Establish a similar relationship between figure C and D by choosing a figure from the answer set.



(B) Which figure is embedded in the pattern given in fig. (X)?



Q6 (A) Find the number of triangles in the given figure after labeling A to Y



(B) Give synonym of the following:

(i) Candid (ii) Diminish (iii) Feeble (iv) Genuine

Give antonym of the following:

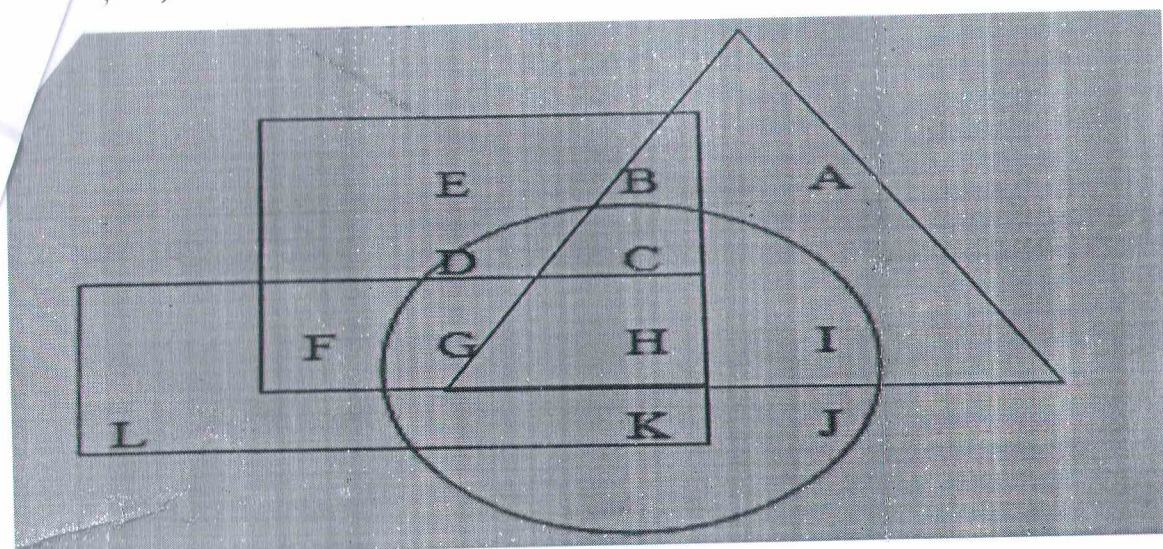
(i) Ancient (ii) Cruel (iii) Expand

Section-D

Q7 (A) Complete the given figure matrix

Section-B

gram)



(For Reappear Candidates Only (2024-25))

Exam Code: 508403

Paper Code: 9328

Programme: Master of Science (Mathematics) (FYIP) (Semester: III)

Course Title: Linear Algebra

Course Code: FMAL-3334

Time Allowed: 3 Hours

Max Marks: 80

Note: Attempt five questions in all selecting at least one question from each section. The fifth question can be attempted from any section. Each question carries 16 marks.

Section-A

1. (a) Define a vector space and its subspace and give examples of each.
- (b) Prove or disprove that the intersection of two subspaces of a vector space is also a subspace. [8 X 2=16]
2. (a) Determine whether or not the set of vectors $(1, 2, 3), (2, 4, 6), (1, 1, 1)$ in $\mathbb{R}^3$ are linearly independent.
- (b) Prove or disprove that the union of two subspaces is a subspace only if one is contained in the other. [8 X 2=16]

Section-B

3. (a) Define basis and dimension of a vector space with an example.
- (b) Justify whether or not that any two bases of a finite-dimensional vector space have the same number of element. [8 X 2=16]
4. (a) Let U and W be subspaces of $\mathbb{R}^4$ given by $U = \{(a, b, c, d) : b + c + d = 0\}$ and $W = \{(a, b, c, d) : a + b = 0, c = 2d\}$. Find basis and dimension of $U \cap W$.
- (b) Define quotient space and direct complement of subspace. Give one example for each. [8 X 2=16]

Section-C

5. (a) Define a linear transformation. Show that $T: \mathbb{R}^2 \rightarrow \mathbb{R}^2$ defined by $T(x_1, x_2) = (x_2, 0)$ is linear.
- (b) Find a linear transformation $T: \mathbb{R}^3 \rightarrow \mathbb{R}^3$ whose range space is spanned by $(1, 0, 1)$ and $(0, 1, 1)$. [8 X 2=16]
6. (a) State and prove the Rank–Nullity Theorem.
- (b) Find the matrix of $T(x, y) = (3x - 2y, x + 5y)$ relative to the basis $B = \{(1, 3), (3, 4)\}$. [8 X 2=16]

Section-D

7. (a) Define an elementary matrix and give an example.
- (b) Prove or disprove that the elementary row operations preserve the rank of a matrix. [8 X 2=16]
8. (a) Reduce the following matrix to its normal form and find its rank.

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 5 & 7 \end{bmatrix}$$

- (b) Solve the system of equations:

$$x + 2y - z = 1, 2x + y + 2z = 3, x - 4y + 7z = 4.$$

[8 X 2=16]

Exam Code: 508403

Paper Code: 3197

Programme: Master of Science (Mathematics) (FYIP)

Semester – III

Course Title: Basics of Python Programming

Course Code: FMAM-3334

Time Allowed: 3 Hours

Max. Marks: 40

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 8 marks. The use of scientific calculators is permitted (non-programmable). Draw neat, well-labeled diagrams wherever required.

SECTION-A

- Q1. (a) Explain the main features of Python that make it popular for scientific computing. (3)
(b) Discuss different data types available in Python with suitable examples. (2)
(c) Write a Python program to find the largest of three numbers using conditional statements. (3)
- Q2. (a) What are mutable and immutable objects in Python? Explain with examples. (2)
(b) Differentiate between tuple and list. (3)
(c) Write a short program to interchange keys and values in a dictionary. (3)

SECTION-B

- Q3. (a) Explain different types of loops in Python with syntax and example. (2)
(b) Write a program using nested loops to print the following pattern:
1
12
123
1234
(3)

- (c) Discuss recursion in Python. Write a recursive function to find the factorial of a number. (3)
- Q4. (a) Explain various categories of function arguments in Python with examples. (2)
- (b) What is a lambda function? Write a lambda expression to compute the cube of a number. (3)
- (c) Using the math module, write code to compute square root, $\log_{10}$, and power of a number. (3)

SECTION-C

- Q5. (a) Differentiate between module and package in Python. (3)
- (b) Explain the use of `dir()` and `reload()` functions. (2)
- (c) Write a Python program that creates and imports a user-defined module for calculating area of rectangle and circle. (3)
- Q6. (a) What is the purpose of namespaces and scope resolution in Python? (2)
- (b) Write a Python code using datetime module to display current date and time in a formatted string. (3)
- (c) Describe trigonometric and angular functions available in the math module. (3)

SECTION-D

- Q7. (a) Explain file handling modes in Python. (3)
- (b) Write a Python program to read a text file and count the number of lines, words, and characters. (3)
- (c) What are directories in Python? Write a short code to create and delete a directory. (2)
- Q8. (a) Discuss matrix operations in Python using the NumPy library. (3)
- (b) Write code to compute the determinant and inverse of a 3×3 matrix using NumPy. (3)
- (c) Explain eigenvalues and their importance in linear algebra applications. (2)

Exam Code: 508405
(20)

Paper Code: 5175

Programme: Master of Science (Mathematics) (FYIP)
Semester-V

Course Title: Number Theory

Course Code: FMAL-5331

Time Allowed: 3 Hours

Max Marks: 80

Note: Attempt five questions in all, selecting at least one question from each section. The fifth question may be attempted from any Section. All questions carry equal marks.(16 marks each).

Section-A

1. (a) Find all positive solutions in integers for $7x+19y=213$.

8

(b) Prove that an integer is divisible by 4 if and only if the number formed by its last two digits is divisible by 4.

8

2. (a) Find the smallest integer $a > 2$, such that

$$2 \mid a, 3 \mid (a+1), 4 \mid (a+2), 5 \mid (a+3), 6 \mid (a+4).$$

8

- (b) Check whether $\{-27, -18, 10, 17, 20, 49\}$ is a complete residue system (mod 6). 8

Section-B

3. (a) Prove that the linear congruence $ax \equiv b \pmod{m}$ has a solution if and only if $d \mid b$ where $d = \gcd(a, m)$. 8
- (b) Solve the system of given congruences: $x \equiv 3 \pmod{13}, x \equiv 7 \pmod{11}, x \equiv 5 \pmod{7}$ 8
4. (a) Check whether 1729 is a pseudo prime or not. 8
- (b) State and prove Fermat's theorem. Is its converse true? Justify your answer. 8

Section-C

5. (a) Let p denotes a prime. Then using Wilson's theorem check whether $x^2 \equiv -1 \pmod{p}$ has solution if $p = 2$ or $p \equiv 1 \pmod{4}$. 8
- (b) Check whether for any positive integer $n, \phi(3(n)) = 3\phi(n)$ if $3 \nmid n$. 8

6. (a) Using Euler theorem, prove that $3^{500} \equiv 1 \pmod{100}$. 8
- (b) Verify that $\sum_{d|36} \phi(d) = 36$. 8

Section-D

7. (a) Prove that the sum function $\sigma(n)$ is a multiplicative function. 8
- (b) Check whether $\prod_{d|n} d = n^{\frac{\tau(n)}{2}}$. 8
8. (a) For every positive integer n having k distinct prime factors $\sum_{d|n} \mu(d)\tau(d) = (-1)^k$. Prove or disprove above statement. 8
- (b) By using Mobius Inversion formula, find the value of $\phi(n)$. 8

Exam Code: 508405
(20)

Paper Code: 5176

Programme: Master of Science (Mathematics) (FYIP)
Semester-V

Course Title: Discrete Mathematics

Course Code: FMAL-5332

Time Allowed: 3 Hours

Max Marks: 80

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question can be attempted from any section. Each question carries 16 marks.

Section-A

1. a) Let A be the set of positive factors of 70. Two binary operations '+' and '.' are defined as follow:

$$a + b = l.c.m(a, b) \text{ and } a.b = g.c.d(a, b) \forall a, b \in A.$$

A unary operation '.' on A defined as $a' = \frac{70}{a} \forall a \in A$. Is

$(A, +, \cdot, ')$ a Boolean algebra?

- b) Consider the Boolean expression $f_1(a, b, c) = ((ab)'c)'((a' + c)(b' + c'))'$ into a sum-of-product form.

(10,6)

2. a) Consider the Boolean function $f(a, b, c) = a'b(a' + c) + ab'(b' + c)$, Solve it algebraically.

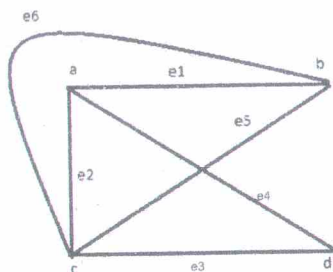
- b) Simplify f (in part(a)) with the help of karnaugh Map.
- c) Draw the switching (on-off) circuit of f and the reduction of f obtained in part (a).
- d) Draw the circuit (gate) diagram of the reduction of f obtained in (b) . (4,4,4,4)

Section-B

3. a) How many nodes are necessary to construct a 2 regular graph with exactly 6 edges?
 b) Define the union and intersection of two graphs with an example.
 c) Let $G=(V,E)$ be a simple connected planar with more than one edges then following inequality holds:
 - (i) $2|E| \geq 3R$
 - (ii) $|E| \leq 3|V| - 6$
 - (iii) There exist a vertex ' v ' of G such that $\deg(v) \leq 5$ (4,4,8)
4. a) Define the Euler circuit and Hamiltonian Circuit, give an example of a graph which is Euler circuit but not Hamiltonian circuit.

Lib 6/12/25 mark

b) Find the Euler path or circuit (if exist) in the following graph



c) Explain the Konigsberg problem with the help of Graph.

d) Prove that If a graph has an Euler path then it has exactly two vertices of odd degree. Is the converse true, if not then under what condition the converse is true. Explain it.

(3,3,5,5)

Section-C

5. a) Let $G = (V, E)$ be an undirected graph with no self loops and $|V| = n$. The following are all equivalent:
- G is a tree.
 - For each pair of distinct vertices in V there exists a unique simple path between them.
 - G is connected and if $e \in E$, then $(V, E - \{e\})$ is disconnected.

- (iv) G contains no cycle but by adding one edge, you create a cycle.
- (v) G is connected and $E=n-1$
- (vi) Prove that maximum no. of vertices on level n of a binary tree is 2^n (10,6)
6. a) Draw the unique binary tree. Given that

In-order	q	b	c	a	g	p	e	d	r
Pre-order	g	b	q	a	c	p	d	e	r

- (b) Define Spanning tree and Give all spanning trees of K_4 .

(8,8)

Section-D

7. a) What are the fundamental connectors. Explain it with the help of an example.
- b) Check whether that $(p \uparrow q) \oplus (p \uparrow q)$ is equivalently to $(p \vee q) \wedge (p \downarrow q)$ or not? (8,8)
8. a) Check whether that $p \vee \sim (p \wedge q)$ is tautogy or not? (8,8)

- b) Determine the validity of the following argument:

Either I will pass the examination or I will not graduate. If I do not graduate, I will go to Canada. I failed : Thus, I will go to Canada (8,8)

Exam Code: 508405
(20)

Paper Code: 5177

Programme: Master of Science (Mathematics) (FYIP)
Semester-V

Course Title: Linear Integral Equations

Course Code: FMAL-5333 ✓

Time Allowed: 3 Hours

Max Marks: 80

Note: There are total Eight question of equal marks (16marks each), two in each of the section (A-D). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Section-A

1. (a) Show that $F(x) = \cos 2x$ is a solution of the equation

$$F(x) = \cos x + 3 \int_0^{\pi} K(x, \eta) F(\eta) d\eta$$

$$\text{Where } K(x, \eta) = \begin{cases} \sin x \cos \eta, & 0 \leq x \leq \eta \\ \cos x \sin \eta, & \eta \leq x \leq \pi \end{cases}$$

8

b) Obtain the resolvent kernels of the integral equation with the following kernel $\lambda=1, k(x, \eta)=2x$.

8

2. a) Solve the integral equation

$$F(x) = (1+x) + \lambda \int_0^x (x-\eta)F(\eta) d\eta \quad 8$$

b) Solve $y(x) = 29 + 6x + \int_0^x [5 - (x-t)]y(t)dt$.

8

Section-B

3. a) Solve the integral Equation $g(s) = f(s) + \lambda \int_0^{2\pi} \sin s \cdot \cos t g(t)dt$ to a resolvent kernel. 8

b) Define

(i) Symmetrical kernel

(ii) Algebraic multiplicity of eigen value. 8

4. a) Find the eigen values and eigen functions of the homogeneous integral equation

$$F(x) = \lambda \int_0^\pi (\cos^2 x \cos 2\eta + \cos 3x \cos^3 \eta)F(\eta) d\eta$$

8

- b) Solve the integral equation by the method of successive approximations $y(x) - \frac{5x}{6} + \frac{1}{2} \int_0^1 x t y(t) dt$.

8

Section-C

5. a) Solve by the method of Laplace transform

$$3\sin 2x = y(x) + \int_0^x (x-t)y(t)dt \quad 8$$

- b) Solve the integral equation

$$F(t) = t^2 + \int_0^t F(u)\sin(t-u)du \quad 8$$

6. a) Solve the integral equation $t = \int_0^t e^{(t-u)}F(u)du$ 8

- b) Solve the Abel's integral equation

$$\int_0^t \frac{F(u)du}{\sqrt{(t-u)}} = 1 + t + t^2 \quad 8$$

Section-D

7. a) Define Green's function and discuss its four properties. 8

b) Reduce the boundary value problem $y'' + \lambda y = x, y(0) = y\left(\frac{\pi}{2}\right) = 0$ to an integral equation. 8

8. a) Reduce the boundary value problem $y'' + xy = 1, y(0) = 0, y(1) = 1$ to an integral equation. 8

b) Construct Green's function for the homogeneous boundary value problem $\frac{d^4 y}{dx^4} = 0, y(0) = y'(0) = y(1) = y'(1) = 0$ 8

Exam Code: 508405
(20)

Paper Code: 5178

Programme: Master of Science (Mathematics) (FYIP)
Semester-V

Course Title: Riemann Integration

Course Code: FMAL-5334

Time Allowed: 3 Hours

✓ Max Marks: 80

Note: Attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. Each question carries 16 marks.

Section-A

1. (a) Define Norm of a partition. 02
 (b) Let f be a bounded function defined on $[a, b]$. If P_1 and P_2 are any two partitions of $[a, b]$. Then $U(P_2, f) \geq L(P_1, f)$ 07
 (c) Prove that lower R-integral cannot exceed the upper R-integral. 07
2. (a) Show that $f(x) = \sin x$ is integrable on $\left[0, \frac{\pi}{2}\right]$ and $\int_0^{\frac{\pi}{2}} \sin x \, dx = 1$. 08

(b) State the prove Darboux Theorem.

08

Section-B

3. (a) Every continuous function is integrable.

08

(b) If f is bounded and integrable in $[a, b]$ then $|f|$ is also

bounded and integrable in $[a, b]$ and $|\int_a^b f(x) dx|$

$$\leq \int_a^b |f(x)| dx.$$

08

4. (a) Let $f \in R[a, b]$. Then prove that the function defined

on $[a, b]$ by $F(x) = \int_0^x f(t) dt$ is continuous.

08

(b) If f is continuous in $[a, b]$ then there exists a number

c , lying between a and b such that $\int_a^b f(x) dx =$

$$(b - a)f(c)$$

08

Section-C

5. (a) Show that Beta function $\int_0^1 x^{(m-1)} (1-x)^{(n-1)} dx$

converges iff $m > 0$ and $n > 0$.

08

(b) Show that $\int_0^{\frac{\pi}{2}} \log \sin x dx$ is convergent and hence

evaluate it.

08

6. (a) Show that $\int_0^{\infty} \sin x^2 dx$ is convergent. 08

(b) If $\int_0^{\infty} f(x)dx$ is convergent at ∞ and $\varphi(x)$ is bounded and monotonic for $x \geq a$ then $\int_a^{\infty} f(x)\varphi(x)dx$ is convergent at ∞ . 08

Section-D

7. (a) Prove that every absolute convergent integral ^{is} ~~in~~ convergent. 06

(b) If n is a positive integer, prove that

$$2^n \Gamma\left(n + \frac{1}{2}\right) = 1.3.5 \dots (2n - 1)\sqrt{\pi}. \quad 06$$

(c) Evaluate $\int_0^{\infty} x^6 e^{-2x} dx$. 04

8. (a) Prove that $B(m, n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)} m > 0, n > 0$. 08

(b) Prove that $\int_0^{\frac{\pi}{2}} (\tan x)^n dx = \frac{\pi}{2} \sec \frac{n\pi}{2}, -1 < n < 1$ 04

(c) If n is a non-negative integer, then $\Gamma(n+1) = n!$ 04

Exam Code: 508405
(20)

Paper Code: 5179

Programme: Master of Science (Mathematics) (FYIP)
Semester-V

Course Title: Metric Spaces

Course Code: FMAL-5335

Time Allowed: 3 Hours

Max Marks: 80

Note : Attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section, Each question carries 16 marks.

Section — A

1. (a) Let X be a non empty set. Consider a mapping $d: X \times X \rightarrow R$, defined by

$$d(x, y) = \begin{cases} 0, & \text{when } x = y \\ 1, & \text{when } x \neq y \end{cases} \quad \forall x, y \in X$$

Prove that it d is a metric on X .

- (b) Prove that every metric space is pseudo metric space but converse may not be true. (8,8)

2. (a) Prove that interior of any subset of A of metric space (X, d) is largest open subset of A ,
- (b) Let (R, d) be a usual metric space.

Find:-

- (i) Interior
- (ii) Exterior of the following sets :
 - a) $\mathbb{N}$
 - b) $(0,1)$

(8.8)

Section — B

3. (a) Prove that closed subset of compact set are compact.

(b) Is Usual metric space $(\mathbb{R}, d)$ compact or not?

(10,6)

4. (a) State and prove Heine Borel theorem.

(b) Prove that a metric space (X, d) is disconnected iff there exist a non empty proper subset of X which is both open as well as closed

(8,8)

Section — C

5. (a) Prove that every convergent sequence is bounded but converse is not true.

(b) Prove that the set of complex numbers with usual metric space is complete metric space

(8,8)

6. State and prove Cantor's intersection theorem

(16)

Section — D

7. (a) Let (X, d_1) and (Y, d_2) be two-metric space. Prove that A function $f: X \rightarrow Y$ is continuous iff $f^{-1}(G)$ is open set in X for every open set G in Y .

(b) Give an example to show that the continuous image of an open set need not to be open. (8,8)

8. (a) Is every continuous function a uniform continuous ?
If not then under what conditions a continuous function is uniformly continuous.

(b) State and prove Intermediate Value Theorem.

(10,6)

(For Reappear Candidates Only (2024-25))

Exam Code : 508601

Paper Code : 9116

Master of Science (Physics) (FYIP) (Semester-I)

Course Title: Organic Chemistry

Course Code: FPHL-1086

Time Allowed : 3 Hours

Max. Marks : 70

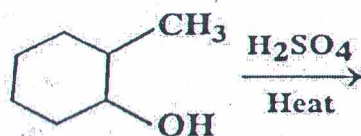
Note: Attempt five questions in all selecting at least one question from each section. The fifth question can be attempted from any section. Each question carries 14 marks.

Section – A

- (a) What do you mean by hyperconjugation. Why it is called no bond resonance. Explain with suitable example relative stability of alkenes. (7)
 - (b) Differentiate between electrophiles and nucleophiles, providing examples for each. Explain their importance in organic reaction with mechanism. (7)
- (a) What are carbanion? Discuss its structure, generation and factors affecting generation of carbanion intermediate. (7)
 - (b) Give the main point of the difference between resonance effect and inductive effect with suitable example. (7)

Section – B

- (a) Describe the addition of hydrogen halides to alkenes. Explain both Markovnikov and anti-Markovnikov additions with mechanisms and suitable examples. (7)
 - (b) How will you explain alkynes undergo nucleophilic addition reactions but alkene do not? and identify the reaction and write mechanism of following organic transformation. (7)



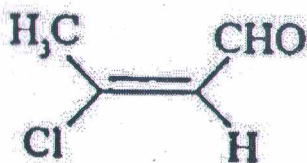
- (a) Discuss with detailed mechanism : Birch reduction and Diels- Alder reaction. (7)
 - (b) Explain the selective methods of preparation of alkenes through dehydration of alcohols and dehydrohalogenation of alkyl halides. Discuss the E1 and E2 mechanisms involved and justify the product formation using Saytzeff's rule. (7)

Section – C

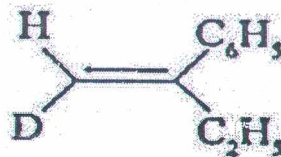
- (a) Discuss SN1 mechanism of nucleophilic substitution reaction with detailed discussion on rearrangement, stereochemistry and solvent effect. (7)
 - (b) Describe the mechanism of the Wittig reaction. Explain how ylide formation occurs and discuss the significance of the Wittig reaction in organic synthesis. (7)
- (a) Explain the aldol condensation reaction with mechanism. Discuss the conditions required, variations of the reaction, and give suitable examples of both aldol addition and aldol condensation products. (7)
 - (b) Write a note on Williamson ether synthesis and Auto oxidation (7)

Section – D

7. (a) Differentiate between enantiomers, diastereomers, and D-/L-isomers. Support your answer with suitable examples. (7)
- (b) Explain the E/Z system for naming alkenes and assign E/Z configurations to the following: (7)

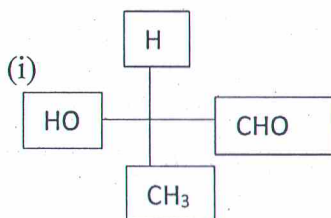


(i)

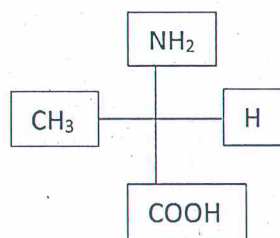


(ii)

8. (a) Draw potential energy diagrams for various conformations of n-butane and discuss their relative stabilities. (7)
- (b) Discuss the Cahn-Ingold-Prelog rules for assigning R and S configurations. Assign R and S configuration to the following Fischer Projection formulae. (7)



(ii)



Exam Code: 508601

Paper Code: 1206

Programme: Master of Science (Physics) (FYIP)

Semester-I

Course Title: Mathematical Physics-I

Course Code: FPHL-1335

Time: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

Section-A

Q1 (a) Solve the equation: $(1+y^2)x dx + (1+x^2)y dy = 0$. [7]

(b) Find the solution of $\frac{dy}{dx} = \frac{x-2y+5}{2x+y-1}$. [7]

Q2 (a) If $y_1 = e^{2x}$, $y_2 = e^{3x}$ and $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0$, then by using Wronskian method check whether y_1, y_2 are linearly independent or not. [7]

(b) Solve the differential equation: $\frac{d^2y}{dx^2} + 2y = x \sin x$. [7]

Section-B

Q3 (a) If $\vec{a}, \vec{b}, \vec{c}$ are vectors, then check whether or not $2[\vec{a}, \vec{b}, \vec{c}] = [\vec{a} + \vec{b}, \vec{b} + \vec{c}, \vec{c} + \vec{a}]$. [7]

(b) Find h for which the points $(3, 2, 1)$, $(4, h, 5)$, $(4, 2, -2)$ and $(6, 5, -1)$ are coplanar. [7]

Q4 (a) Solve Cauchy Euler equation:

$$x^3 \frac{d^3 y}{dx^3} + 3x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} = x^3 \log x. \quad [7]$$

(b) Solve by method of variation of parameters: $\frac{d^2 y}{dx^2} + y = \operatorname{cosec} x$. [7]

Section-C

Q5 (a) Find the directional derivative of the function $f = xy^2 + yz^3$ at the point $(2, -1, 1)$ in the direction of vector $(1, 2, 2)$. [7]

(b) Find the divergence and curl of $\vec{v} = (xyz) \hat{i} + (3x^2 y) \hat{j} + (xz^2 - y^2 z) \hat{k}$ at $(2, -1, 1)$. [7]

Q6 (a) Prove or disprove that $\operatorname{curl} \operatorname{grad} f = 0$ for any scalar f . [7]

(b) If $u = x^2 - y^2 + 4z$, find $\nabla^2 u$. [7]

Section-D

Q7 (a) Verify Gauss Divergence Theorem for the vector $\vec{F} = x\hat{i} + y\hat{j} + z\hat{k}$ over the region bounded by $x^2 + y^2 + z^2 = a^2$. [7]

(b) Express $2y\hat{i} - z\hat{j} + 3x\hat{k}$ in spherical polar coordinates. [7]

Q8 (a) Derive an expression for $\nabla\phi$ (i.e. $\operatorname{grad}\phi$) in orthogonal curvilinear co-ordinates. [7]

(b) Verify Green's theorem in plane for

$$\oint_C (-8y^2 + 3x^2)dx + (4y - 6xy)dy,$$

around the boundary C of the region enclosed by $x^2 = y$ and $\sqrt{x} = y$. [7]

Exam Code: 508601
(30)

Paper Code: 1204

Programme: Master of Science (Physics) (FYIP)
Semester-I

Course Title: Mechanics

Course Code: FPHL-1393 ✓

Time Allowed: 3 Hours

Max Marks: 70

Note:- Attempt five question in all, taking at least one question each from section A, B, C & D. All questions carry 14 equal marks.

Section A

1. Show that rotational invariance leads to the conservation of angular momentum. (14)
2. What is meant by Galilean transformations and Galilean invariance? Show that law of conservation of momentum is invariant under Galilean transformations. (14)

Section B

3. Find the general expression for kinetic energy of a rigid body rotating about Principal axes? (14)
4. Define moment of inertia, elementary gyroscope and its applications, precession. (14)

Section C

5. State Newton's law of gravitation. What is meant by gravitational constant? Distinguish between gravitational and inertial mass. (14)
6. What is reduced mass? Reduce the two body problem to one body problem and obtain the equation of motion for equivalent one body problem of two masses. (14)

Section D

7. Discuss the effect of Coriolis force in case of freely falling body on the surface of earth. (14)
8. Describe the construction of Foucault's pendulum. Show that rotation of plane of oscillation of the Foucault's pendulum is direct proof of the rotation of the earth about its own axis. (14)

Exam Code: 508601
(30)

Paper Code: 1205

Programme: Master of Science (Physics) (FYIP)
Semester-I

Course Title: Thermal Physics

Course Code: FPHL-1394 ✓

Time Allowed: 3 Hours

Max Marks: 70

Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Note: Students can use Non-Scientific calculators or logarithmic tables. All questions carries equal marks (14)

Section A

1. (a) Derive an expression for the efficiency of Carnot's heat engine, using one mole of an ideal gas as the working substance. (10)
(b) A Carnot's heat engine absorbs heat from source at 500K and rejects a part of heat to sink at 300 K. If the heat absorbed from the source be 1000 cal, then calculate the heat rejected to sink. (4)
2. (a) What is entropy? Prove that the entropy of a thermodynamical system remains constant in any reversible process. Also discuss the law of increase of entropy in natural process, giving suitable examples. (7)

- (b) Show that no irreversible heat engine can have efficiency greater than that of reversible heat engine working between same temperatures. (7)

Section B

3. (a) Show that in thermodynamics.

$$\frac{dp}{dT} = \frac{L}{T(V_2 - V_1)}$$

Discuss the effect of pressure on melting and boiling points of a substance. (7)

- (b) A wire is stretched adiabatically, show that the change in its temperature is given by

$dT = -\frac{n^{Tl}}{mC_p} dF$, where symbols have their usual meanings. Why does a rubber string heat up on stretching? Explain. (7)

4. What are thermodynamic potentials? Give their significance. Establish Four Maxwell's thermodynamic relations. (14)

Section C

5. Define first and second order phase transitions. Assuming the Gibb's function per unit mass remains constant in a first order phase change, obtain Clausius-Clapeyron's latent heat equation. Compare the change in g , s and v in the first and second order phase transitions. (14)

6. Give an account of Joule-Thomson experiment. Show that the change in temperature in a Joule-Thomson expansion is given by

$$dT = \frac{V}{C_p} (T\alpha - 1) dP.$$

Why does an ideal gas show neither a heating nor cooling effect in Joule-Thomson expansion. Analyse thermodynamically Joule Thomson effect for Vander Waal gasses. (14)

Section D

7. Using classical statistics to treat an ideal gas as a system, derive the Maxwell-Boltzmann distribution law for molecular speeds. Additionally, derive the expressions for the most probable speed, average speed, and root mean square speed. (14)
8. (a) What is the meaning of the term "degrees of freedom". Discuss how the specific heat of gasses and solids can be determined on the basis of the law of equipartition of energy. (7)
- (b) Explain the concept of Doppler Broadening of spectral lines. (7)

Exam Code: 508601

Paper Code: 1208

Programme: Master of Science (Physics) (FYIP) Semester-I

Course Title: Computer Fundamentals and PC Software

Course Code: FPHM-1126

Time Allowed: 3 Hours

Maximum Marks: 40

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 8 marks.

SECTION-A

1. Explain the different Generations of Computers, highlighting the key technological advancements that defined each generation. (8 Marks)
2. Draw and label the Block Diagram of a Computer system. Briefly explain the primary function of the Central Processing Unit (CPU), Memory, and Input / Output Devices, and describe their interrelation in processing data. (8 Marks)

SECTION-B

3. (a) Differentiate between System software and Application software, providing examples of each. (4 Marks)
(b) Explain the concept of Programming languages and their role in a computer system. (4 Marks)
4. Discuss the characteristics and working principles of the following input/output devices: (2+2+2+2 Marks)
(a) Optical Mark Reader (b) Optical Character Recognition
(c) Plotters (d) Voice Output Systems

SECTION-C

5. Define an Operating System and explain its primary purpose in managing system resources. Differentiate between the interaction methods of a Windows GUI (Graphical User Interface) and a Command-line interface. (8 Marks)
6. (a) Explain the procedure and utility of using Macros and mail merge in a Word Processor. (4 Marks)
(b) Describe the steps for inserting page numbers, bookmarks, and setting up a document for printing. (4 Marks)

SECTION-D

7. (a) Explain the process of inserting audio and video into a Presentation. (4 Marks)
(b) Describe the steps for formatting a presentation and playing slides. (4 Marks)
8. (a) Explain the concepts of sorting and filtering data in a Spreadsheet. (4 Marks)
(b) Describe the steps and utility of using Charts and Graphs to represent data in a spreadsheet. (4 Marks)

Exam Code: 508603

Paper Code: 3201

Programme: Master of Science (Physics) (FYIP)

Semester – III

Course Title: Statistics

Course Code: FPHL-3173

Time Allowed: 3 Hours

Maximum Marks: 70

Note: Attempt five questions in all, selecting at least one question from each Section. Fifth question may be attempted from any section. Each question carries 14 marks. Non-scientific calculators are permitted. Graph paper and logarithmic tables will be provided.

SECTION-A

1. (a) Define an ideal measure of central tendency and discuss the properties it should possess. Compare the Arithmetic Mean, Median, and Mode based on these properties. (7 marks)
 (b) The marks obtained by 50 students in an examination are given. Construct a continuous frequency distribution and represent the data using a suitable diagrammatic representation (e.g., a Frequency Polygon). (7 marks)
 Example Data: 25, 30, 42, 55, 61, 70, 75, 48, 52, 65, 33, 39, 58, 62, 71, 78, 80, 50, 45, 60, 28, 35, 44, 57, 68, 72, 77, 82, 85, 41, 46, 59, 63, 73, 76, 81, 84, 88, 90, 31, 37, 49, 53, 66, 69, 74, 79, 83, 86, 89.
2. (a) Explain the purpose and method of constructing a Histogram and a Less than Ogive (Cumulative Frequency Curve). Illustrate how the values of the Mode and the Median can be determined graphically from these diagrams. (7 marks)
 (b) Find the Geometric Mean (G.M.) for the following discrete frequency distribution: (7 marks)

Variable (x)	5	15	25	35	45
Frequency (f)	2	4	6	3	5

SECTION-B

3. (a) Explain the concept of Dispersion in statistics. Define Standard Deviation and state its advantages as a measure of dispersion over the Mean Deviation and Quartile Deviation. (7 marks)
 (b) Calculate the Coefficient of Variation (C.V.) for the following distribution and use it to comment on the consistency of the data.

Class Interval:	0-10	10-20	20-30	30-40	40-50
Frequency:	5	8	15	16	6

(7 marks)

4. (a) Show that the Standard Deviation is independent of the change of origin but not of the change of scale. (7 marks)
 (b) The following results were calculated for scores in two tests, P and Q:
 Test P: Mean = 60, Standard Deviation = 12
 Test Q: Mean = 80, Standard Deviation = 10

If the number of students who appeared for both tests was the same, compare the relative measures of dispersion for the two tests.

(7 marks)

SECTION-C

5. (a) Define a Moment in statistics. Differentiate between a Central Moment and a Raw Moment (Moment about an arbitrary origin, A). Establish the relationship for the first central moment (m_1) in terms of raw moments and interpret the result. (7 marks)
 (b) Calculate Bowley's Coefficient of Skewness for the following distribution and comment on the nature of the skewness. (7 marks)

Weekly Wages (₹)	100-120	120-140	140-160	160-180	180-200
No. of Workers (f)	10	15	30	18	7

6. (a) State and explain Sheppard's correction for moments. Under what conditions is this correction applied? (7 marks)
 (b) For a frequency distribution, the moments about the value 5 are $m'_1 = 2$, $m'_2 = 20$, $m'_3 = 40$, and $m'_4 = 150$. Calculate the first four central moments (m_1 , m_2 , m_3 , m_4) and comment on the Skewness and Kurtosis of the distribution. (7 marks)

SECTION-D

7. (a) Define mutually exclusive events and exhaustive events with suitable examples. State and prove the additive law of probability for two events A and B. (7 marks)
 (b) In a factory, machines A, B, and C manufacture 30%, 30%, and 40% of the total production, respectively. Past experience shows that 2%, 3%, and 4% of the products manufactured by machines A, B, and C, respectively, are defective. If a product is randomly selected and found to be defective, what is the probability that it was manufactured by machine B? (7 marks)
8. (a) State and explain the various definitions of probability. Define an axiomatic probability function and list its key properties. (7 marks)
 (b) If A and B are independent events, show that: (7 marks)
 (i) $\bar{A}$ and B are independent. (ii) $\bar{A}$ and $\bar{B}$ are independent.

Exam Code: 508603

Paper Code: 3199

Programme: Master of Science (Physics) (FYIP) Semester III

Course Title: Electromagnetic Theory

Course Code: FPHL-3391

Time Allowed: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 14 marks. Students can use Non-Scientific calculators or logarithmic tables.

Section A

1. (a) Discuss the phenomenon of mutual induction and find the expression for mutual inductance of two coils and hence prove the reciprocity theorem? (8)
- (b) Calculate the coefficient of self induction of an iron cored solenoid having area of cross-section 5 cm^2 , length 2 m and number of turns 5000? $\mu_r = 100$. (6)
2. State Maxwell's four equations for electrodynamics and derive their differential form. (14)

Section B

3. (a) Drive the wave equation in terms of electric field for EM waves in conductors and dielectrics? Give the solution of wave equation for a plane polarized wave in both the cases? (8)
- (b) Discuss the response of a conducting medium to EM waves at low and high frequencies. (6)
4. (a) Derive the Poynting theorem from Maxwell's equations. Interpret the Poynting vector physically and discuss how it quantifies instantaneous and average power flow. (8)
- (b) A linearly polarized plane electromagnetic wave in vacuum is propagating in the $+z$ direction. The electric and magnetic fields are: $E(z, t) = E_0 \cos(kz - \omega t) \hat{x}$

$B(z, t) = B_0 \cos(kz - \omega t) \hat{y}$, Given: $E_0 = 200 \text{ V/m}$, $c = 3.0 \times 10^8 \text{ m/s}$, $\mu_0 = 4\pi \times 10^{-7} \text{ H/m}$

$\eta_0 \approx 377 \Omega$

(i) Find the instantaneous Poynting vector $S(z, t)$.

(ii) Find the time-average Poynting vector $\langle S \rangle$. (6)

Section C

5. Discuss the reflection and refraction of plane waves at a boundary separating two dielectric media. Explain how boundary conditions on $\mathbf{E}$ and $\mathbf{H}$ lead to the emergence of the classical laws of reflection and refraction. (14)

6. (a) Explain with suitable mathematical arguments why electromagnetic waves are transverse in nature. Discuss how boundary conditions support this conclusion. (8)

(b) What is TIR of electromagnetic waves? Drive the expression for critical angle? (6)

Section D

7. What is circular polarization? Derive the general equation describing the trajectory of the electric field vector for an circularly polarized wave. Under what limiting circumstances does it degenerate into linear or circular polarization? (14)

8. (a) Discuss in detail the operating principle of a Half-Wave Plate. Derive the retardation condition and explain how the device induces rotation of the plane of polarization. (8)

(b) What is double refraction (birefringence)? Explain the fundamental reason behind its occurrence in anisotropic media. Using suitable arguments, explain the emergence of ordinary and extraordinary rays. (6)

Exam Code: 508603

Paper Code: 3200

Programme: Master of Science (Physics) (FYIP) Semester III

Course Title: Optics

Course Code: FPHL-3392 ✓

Time Allowed: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 14 marks. Students can use Non-Scientific calculators or logarithmic tables.

Section A

1. a) Explain Haidinger and Fizeau fringes. Discuss the formation of Fizeau fringes with Newton ring apparatus. Explain the formation of Newton's ring by reflected light. Describe the method to measure refractive index of material using Newton rings. (12)

b) Calculate the fringe width of the interference pattern produced in a young's double slit experiment with two slits 10^{-3} m apart on a screen 1 m away. The wavelength of light is 589.3nm. (2)

2. a) Describe the Fresnel's biprism method of finding the wavelength of light. Give theory of the method. Explain what happens when white light is used to illuminate the slit. How Fresnel biprism interference differs with that of Lloyd single mirror. (10)

b) Can interference occur with longitudinal waves? Explain. (2)

c) Can two independent point sources, say two electric lamps operating under similar conditions, produce sustained interference patterns? Why? (2)

Section B

3. a) Describe Fraunhofer diffraction of double slit and discuss central as well as secondary maxima. (9)

b) On moving a movable mirror in Michelson Interferometer through 2.3×10^{-4} m, 790 fringes are observed to cross the field of view. Calculate λ . (3)

c) In a single slit diffraction pattern, the width of slit is made double than original width. How does it affect the size and intensity of central diffraction band? (2)

4. a) Explain the principle of Fabry Perot interferometer. Obtain an expression for the intensity of transmitted light with the help of this instrument. Also explain the visibility and sharpness of the fringes obtained in it. (9)

b) What is the function of additional glass plate in the Michelson's interferometer? (3)

c) Light streaks are seen when we look at a strong source of light with half shut eyes. Explain Why? (2)

Section C

5. a) Describe Fraunhofer diffraction of N slits and discuss the missing orders. (9)

b) Why do we call Fresnel's zone as half period zone? (3)

c) How zone plate differs from convex lens? (2)

6. a) Distinguish between resolving power and dispersive power of a grating. State and explain Rayleigh's criterion for limit of resolution. Derive an expression for resolving power of diffraction grating. (10)

b) Light of wavelength $6000\text{\AA}$ passes through a narrow circular aperture of radius 0.09 cm . At what distance along the axis will the first maximum intensity be observed? (4)

Section D

7. a) Explain the principle of holography. Describe in detail the process of recording and reconstruction of a hologram with the help of a neat diagram. How does holography differ from ordinary photography? (12)

b) If the angle between a polariser and analyser is 30° what will be the intensity of light transmitted, having original intensity I_0 incident on the polariser. (2)

8. a) What is fibre optics? What is the principle of light propagation in optical fibres? Define numerical aperture and acceptance angle of an optical fibre. (7)

b) Discuss with suitable diagram, the principle, construction and working of Ruby laser. (7)

Exam Code: 508603

Paper Code: 3203

Programme: Master of Science (Physics) (FYIP) Semester III

Course Title: Python Programming

Course Code: FPHM-3125

Time Allowed: 3 Hours

Max. Marks: 40

Note: Attempt five questions in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 8 marks.

SECTION-A

1. Write Technical Strengths of Python. What is meant by "Interactive Shell" in Python? How is it different from running a script in Python? (8)
2. Explain Data Types in Python with examples. Write Python Code to
 - (a) Create a Dictionary
 - (b) Modify Dictionary
 - (c) Iteration over a Dictionary(8)

SECTION-B

3. What is a String in Python? Write Python Codes to (a) Concatenate Strings (b) Slice String (c) Compare Strings (d) Convert String from uppercase to lowercase. (8)
4. Explain For Loop in Python using suitable examples. How is it different from While Loop? Write a Python Code to arrange a List in Descending Order using Bubble Sort. (8)

SECTION-C

5. (a) What is difference between Formal and Actual Arguments?
(b) Explain Recursion using a Python Code. (4, 4)
6. (a) Explain the types of Arguments by giving suitable example of each.
(b) By writing a Python Code demonstrates the use of "args" and "kwargs". (5, 3)

SECTION-D

7. (a) What is Read Function in Python? Write a code example to demonstrate the use of read() and readline() functions.

(b) How to open and write into Python Files? Explain using Python Program. (4, 4)

8. (a) List Key differences between Os and Sys modules.

(b) Explain the use of seek() method for manipulating the file pointer using suitable Python Code Example. (5, 3)

Exam Code: 508603

Paper Code: 3202

Programme: Master of Science (Physics) (FYIP) Semester III

Course Title: Introduction to Glass Science and Glass Ceramics

Course Code: FPHM-3394

Time Allowed: 3 Hours

Max. Marks: 40

Note: Attempt five questions in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 8 marks.

Section A

1. Define vitreous state. Discuss how glasses found in nature differ from man-made glasses. 8
2. How is ionic bonding different from covalent and mixed bonding? Give examples to support your claim. 8

Section B

3. Explain the Volume/Temperature diagram and its significance in glass formation. 8
4. According to Zachariasen's what should be the properties of a metal oxide are required for forming a glass? 8

Section C

5. Discuss the effect of temperature and composition on the heat capacity of glasses. 8
6. Discuss the properties and applications of soda-lime, borosilicate. 8

Section D

7. Discuss the recycling challenges associated with glass materials. 8
8. Analyse the economic and environmental implications of large-scale glass manufacturing. 8

Exam Code: 212901

Paper Code: 1270

Programme: Mater of Business Administration (Semester-I)

Course Title: Accounting for Management and Reporting

Course Code: MBAL- 1093 ✓

Time Allowed: 3 Hours

Max Marks: 70

Note: Attempt five questions, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

SECTION-A

1. What is meant by Accounting Principles? What is their necessity? What are the various concepts of Accounting? (14)
2. The Following are the balances taken on 31st March, 2024 from the books of Mr. Arnav Jain: (14)

Particulars	Amount (Rs.)	Particulars	Amount (Rs.)
Drawings	24000	Sales Tax	18,750
Capital	3,50,000	Sundry Creditors	1,53,000
Plant and Machinery	1,96,000	Rent	16,500
Loan @10%	25000	Printing and Stationery	3,250
Bills Receivable	82,000	Insurance	2,000
Stock (1 st April 2023)	79,650	Interest on Loan	2,000
Purchases	5,06,000	Cash in Hand	1,800
Debtors	2,42,000	Bank Overdraft	32,600
Freight on Purchases	3,400	Typewriter	12,000
Bad debts	1,500		
Sales	8,48,700		
Advertising	12,000		
Commission (Cr.)	3600		
Wages	1,16,000		
Trade Expenses	1,900		
Discount Allowed	1600		
Return Inward	9,300		
Cycles	3,750		
Salaries	75,000		
Rates and Taxes	2,500		

Prepare Trading and Profit and Loss Account for the year ended 31st March, 2024 and Balance sheet as on that date, after taking into consideration the following-

- a) Depreciation is to be charged as follows: Plant and Machinery 5% p.a. and Typewriter 10% p.a.
- b) Commission earned but not received Rs. 1,400
- c) Provide for the following outstanding items – Printing Rs. 750 and Rent Rs. 1500
- d) Charge 5% Interest on Capital
- e) Stock on 31st March, 2024 was valued at Rs. 1,26,660

SECTION-B

3. Discuss the tools and techniques of financial statement analysis. Which technique do you consider most effective and why? (14)
4. From the following Balance Sheet of ABC Ltd., analyse the company's Liquidity and Solvency position. (14)

Particulars	2024 (Rs.)	Particulars	2024 (Rs.)
Equity Share Capital	3,82,000	Building	4,00,000
Capital Reserve	1,40,000	Plant and Machinery	1,10,000
Reserves & Surplus	60,000	Furniture	40,000
Trade Creditors	80,000	Freehold property	24,000
Bills Payable	1,20,000	Goodwill	60,000
Bank Overdraft	1,60,000	Cash Balance	40,000
Provisions	40,000	Sundry Debtors	70,000
		Inventories	1,14,000
		Investment(Temporary)	84,000
		Bills Receivable	40,000
	9,82,000		9,82,000

SECTION-C

5. What is Cost-Volume-Profit Analysis (CVP Analysis)? Explain how managers use it for decision-making. Also explain Activity Based Costing. (14)
6. What is Budgetary Control? Explain and illustrate the different types of budgets prepared under a budgetary control system. (14)

SECTION-D

7. Explain the objectives, principles, limitations of financial reporting. (14)
8. Describe in detail the environment of financial reporting and its various components. (14)

L10 11/12/85 K.M.V.-I (EVE)

Exam Code: 212901
(40)

Paper Code: 1271

Programme: Master of Business Administration
Semester-I

Course Title: Legal and Business
Environment

Course Code: MBAL-1094

Time Allowed: 3 Hours

Max Marks: 70

Note: Attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 14 marks.

SECTION-A

1. What are the essentials of a valid contract (14)
2. What are the legal provisions relating to discharge of contract? (14)

SECTION-B

3. What is Globalization? Discuss the effects of globalization on Indian culture, economy, and employment. (14)
4. Explain the concept of privatization. Examine the advantages and disadvantages of privatization in India. (14)

SECTION-C

5. Examine the role of the Consumer Protection Act, 1986, in empowering consumers in India. (14)
6. Discuss Quazi and O'Brien's Two-Dimensional CSR Model and its relevance for business decision-making. (14)

SECTION-D

7. Explain the main objectives of the Foreign Exchange Management Act (FEMA), 1999. Distinguish between FERA and FEMA in terms of objectives and approach. (14)
8. Define monetary policy. Explain its objectives and significance in India. (14)

Exam Code: 212901

Paper Code: 1272

Programme: Master of Business Administration

Semester – I

Course Title: Business Management

Course Code: MBAL-1095

Time Allowed: 3 Hours

Max. Marks: 70

- Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

SECTION A

1. Define Scientific Management. Who gave the concept of Scientific Management? What are some of the major concepts of Scientific Management?
2. Peter F. Drucker gave the concept of Management by Objectives (MBO). Define MBO and explain the steps that an organisation should follow to implement MBO.

SECTION B

3. Differentiate between Line and Staff Organizations. In your opinion, who should be more important – the line or the staff functions in an organization?
4. Define Departmentation. What are some of the bases of Departmentation?

SECTION C

5. What is delegation in management? What are the common obstacles to delegation in organizations? Suggest practical ways to overcome these obstacles.
6. What do you understand by McGregor's Theory X and Theory Y? What are some of the key assumptions in this theory?

SECTION D

7. 'A manager's role is basically that of a coordinator.' Do you agree with this statement? How can managers achieve coordination in their organizations?
8. Define controlling. What are some of the techniques for controlling?

Exam Code: 212901
(40)

Paper Code: 1268

Programme: Master of Business Administration
Semester-I

Course Title: Managerial Economics

Course Code: MBAL-1171 ✓

Time Allowed: 3 Hours

Max Marks: 70

NOTE: Candidates are required to attempt five questions, selecting at least one from each section. The fifth question may be attempted from any section. Each question carries 14 marks.

Section A

1. Discuss in detail is Law of demand with the help of diagram and an example? Also discuss its exceptions.
2. What is price elasticity of demand? Discuss various methods of measuring it.

Section B

3. Define indifference curve. Explain the consumer equilibrium using indifference curve and budget line. Also discuss its superiority over utility analysis.
4. Discuss the law of diminishing marginal utility in detail. Also discuss its limitations.

Section C

5. Discuss the law of returns to scale. Also discuss reasons for its applicability.
6. Discuss the traditional theory of costs. Also discuss why long run average cost curve is U shaped?

Section D

7. What is perfect competition? Discuss the equilibrium of the firm in short run and long run.
8. What is oligopoly? Discuss in detail the equilibrium under collusive oligopoly.

Exam Code: 212901

Paper Code: 1269

Programme: Master of Business Administration

Semester – I

Course Title: Quantitative Methods for Management

Course Code: MBAL-1172

Time Allowed: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

Section-A

1. a) For the following data, set up the regression equation for sales on advertisement expenditure.

Sales (Rs. Crores)	15	16	17	18	19	20
Adv. Exp.	2	3	3.5	4	4.2	5

b) $r_{12}=0.5$, $r_{13}=0.7$ and $r_{23}=0.6$ Find out $r_{12.3}$, $r_{13.2}$, $r_{23.1}$ and $R_{1.23}$

2. a) A bag contains 7 red 6 green balls. Two balls are drawn at random. What is the probability of getting
- Both are green balls
 - One ball is red and the other is green
- b) A problem of statistics is given to three students- A, B, and C, whose chances of solving are $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{4}$. What is the probability that the problem will be solved?

Section-B

- Explain the properties of the normal distribution.
- Explain the discrete and continuous probability distribution

Section-C

5. a) Ten students are selected at random from a college and their marks in statistics are given below

71. 72.73.75. 76.77.78,79, 80

Test the hypothesis that the average marks in statistics of the college are 75

- b) Test the hypothesis of any association between education and area from the following data using the chi-square test

	Rural	Urban	Total
Educated	70	30	100
Uneducated	60	40	100
Total	130	70	200

6. Discuss the procedure for hypothesis testing.

Section-D

7. A steel company has three furnaces and five rolling mills. Transportation cost (rupees per quintal) for sending steel from furnaces to rolling mills is given in the following table:

Furnaces	M ₁	M ₂	M ₃	M ₄	M ₅	Availability(Q)
A	4	2	3	2	6	8
B	5	4	5	2	1	12
C	6	5	4	5	3	14
Requirement (Quintal)	4	4	10	8	8	

How should they meet the requirement? Use VAM.

whereas $x_1, x_2 \geq 0$

8. Solve the following:

$$\begin{array}{ll}
 \text{Minimize} & Z = 5x_1 + 6x_2 \\
 \text{Subject to} & 2x_1 + 5x_2 \geq 1500 \\
 & 3x_1 + x_2 \geq 1200 \\
 & x_1 \& x_2 \geq 0
 \end{array}$$

Exam Code: 212901
(40)

Paper Code: 1273

Programme: Master of Business Administration
Semester-I

Course Title: Automated Spreadsheet Management

Course Code: MBAM-1126

Time Allowed: 3 Hours

Max Marks: 40

Note:.. Attempt five questions in all selecting one from each section and the fifth question may be from any of the four sections Each question carries 8 marks.

SECTION-A

1. (a) Explain the steps to customize worksheet options and views in Excel. (4)
(b) How can you navigate efficiently across multiple worksheets and workbooks? (4)
2. (a) Describe the process of creating and printing tables and graphs in Excel. (4)
(b) What is Advanced Conditional Formatting? Give two business-related examples. (4)

SECTION - B

3. (a) Explain the process of creating, formatting, and modifying a Pivot Table. (4)
(b) What is a Calculated Field? How is it different from a Calculated Item? (4)

4. (a) Define Slicers in Excel. Explain how slicers can be used for dynamic data filtering. (4)
- (b) What are Scenarios and Scenario Reports? How do they support data analysis? (4)

SECTION – C

5. (a) Describe the purpose of logical functions in Excel. How do IF, SUMIF, and AVERAGEIF functions help in performing conditional calculations? Give suitable examples. (4)
- (b) What are the key steps involved in troubleshooting formulas in Excel? (4)
6. (a) What is Data Validation? Discuss various types of data validation supported in Excel. (4)
- (b) How can custom validation formulas be applied? Give suitable examples. (4)

SECTION – D

7. (a) Explain the concept of Hyper linking Data within a workbook and across workbooks. (4)
- (b) How can links between multiple Excel workbooks be updated automatically? (4)
8. (a) Discuss the role of AI-powered features in Excel, such as Smart Formula Suggestions and Automated Data Cleaning. (4)
- (b) Explain Real-world Applications of AI in Business Analytics using Excel. (4)

Exam Code: 225101

Paper Code: 1229

Programme: Master of Science (Botany) Semester-I

Course Title: Computer Applications and Bio-Informatics

Course Code: MBTL-1046

Time: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

SECTION-A

- 1 a. How do you create, save, and open a new file in MS Word? 7
- b. What are page breaks and how to insert it? 7
- 2 a. How can you insert and format images or graphics in MS Word? 7
- b. How can you apply and customize font styles and sizes? 7

SECTION-B

- 3 How to create charts using different wizards related to graph and charts in M. S. Excel. 14
- 4 Write a note on the following:
 - a) Use of different formulae in excels. 7
 - b) Absolute and relative addressing in MS Excel. 7

SECTION-C

- 5 Explain different types of views available in Power Point. 14
- 6 Write a short note on
 - a) Formatting and enhancing text. 7
 - b) Add music in your slide show in MS PowerPoint Presentation. 7

SECTION-D

- 7 Give a detailed explanation of the different databases used for species identification and classification. 14
- 8 Discuss the following. 5+5+4

a) DDBJ	b) GenBank	c) UNIPORT
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Exam Code: 225101

Paper Code: 1224

Program: Master of Science (Botany) Semester – I

Course Title: Fungi and Plant Pathology

Course Code: MBTL-1071 ✓

Time: 3Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

Section A

- Q1 Explain in details the differences between Gymnomycota and Mastigomycota.
- Q2 Explain the methods of reproduction and life cycle of Zygomycotina.

Section B

- Q3 What are the structural differences between Amastigomycota and Basidiomycotina.
- Q4 Draw the well labelled diagram of life cycle of Sporobolomyces and Cryptococcus.

Section C

- Q5 Explain life cycle of early blight of potato and brown rot of potato.
- Q6 i) Short note on leaf curl of tomato.
ii) Short note on loose smut of wheat.

Section D

- Q7 i) Write a brief note on heterothallism.
ii) Short note on mycoherbicides.
- Q8 i) What is the role of mycorrhizae in agriculture.
ii) Write a note on the important contributors in the plant pathology.

Exam Code: 225101

Paper Code: 1225

Programme: Master of Science (Botany) Semester: I

Course Title: Phycology

Course Code: MBTL-1072

Time Allowed: 3 Hours

Max Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any Section. Each question carries 14 marks. Draw labelled diagrams wherever necessary.

Section-A

1. What are the salient features of Lee's system of classification? How it is different from the earlier classification of Fritsch? (14)
2. Discuss the following: (3.5 X 4 = 14)
 - i. Multicellular habit
 - ii. Habitat of algae
 - iii. Algal Flagella
 - iv. Food reserves in algae

Section-B

3. Write notes on any two of the following: (7 X 2 = 14)
 - i) Types of net and their formation in *Hydrodictyon*
 - ii) Structure of sex organs in *Chara*
 - iii) Sexual reproduction in *Zygnema*
4. Discuss the following: (7 X 2 = 14)
 - i) Cap cell formation in *Oedogonium*
 - ii) Reproduction in *Cladophora*

Section-C

5. Discuss the asexual reproduction in *Ectocarpus*. Give salient features of the genera. (14)
6. Describe in detail the asexual reproduction in *Batrachospermum*. And also discuss how post fertilization changes in *Batrachospermum* differ from *Porphyra*. (7+7)

Section-D

7. What is bioluminescence? Discuss the phenomenon of rhythms and bioluminescence among algae. (14)
8. What are algal blooms? Give economic importance of algae in detail. (14)

Exam Code: 225101

Paper Code: 1226 – R

Programme: Master of Science (Botany) Semester: I

Course Title: Bryology

Course Code: MBTL-1073 ✓

Time Allowed: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks. Draw well labelled diagrams wherever necessary.

Section A

1. Write notes on the following:-
 - i. Why Bryophytes are called the amphibians of plant kingdom?
 - ii. The plant body of Bryophyte is a gametophyte or sporophyte Explain.
2. Write a detailed note on economic uses of Bryophytes.

Section B

3. Elucidate the plant body and life cycle of *Porella* with a special reference to structure of sporogonium and spore dispersal.
4. Explain following:
 - i. Give structure of sporogonium of *Anthoceros*.
 - ii. Describe gametophyte of *Targionia*.

Section C

5. Give a brief account of origin of land habit in Bryophytes.
6. Compare the gametophyte structure in liverworts (*Marchantiales*) and mosses (*Sphaginales*).

Section D

7. How do different environmental factors affect spore dispersal in bryophytes?
8. Write note on following:
 - i. Function of peristomal teeth in regulating spore release
 - ii. Palynology of Bryophytes

Exam Code: 225101

Paper Code: 1226

Programme: Master of Science (Botany) Semester: I

Course Title: Bryology

Course Code: MBTL-1073

Time Allowed: 3 Hours

Max Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks. Draw well labelled diagrams wherever necessary.

Section A

1. Describe habit, habitat and distribution of Bryophytes. 14
2. i. Compare primitive and advance features of Bryophytes. 7
- ii. With reference to fossil record discuss the origin of Bryophytes. 7

Section B

3. Elucidate the plant body and life cycle of Sphagnum with a special reference to structure of sporogonium and spore dispersal. 14
4. Explain following: 2*7=14
 - i. Give life-cycle of Marchantia with diagrams.
 - ii. Describe Sporophyte of Funaria.

Section C

5. How bryophytes developed the land habit? Justify it with suitable examples. 14
6. Explain evolution of sporogonium in Mosses with examples. 14

Section D

7. Describe various methods to Conserve Bryophytes at the National Level. 14
8. Give a detailed overview of the morphogenetic changes that occur in moss protonema? 14

Exam Code: 225101

Paper Code: 1227

Programme: Master of Science (Botany) Semester – I

Course Title: Plant Physiology

Course Code: MBTL-1074

Time Allowed: 3 Hours

Max Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

Section-I

- Ques. 1 a. Describe the nature and examples of energy-rich bonds? 7
b. Explain the types and importance of weak molecular interactions in biological systems. 7
- Ques. 2 Explain the fundamental concept of coupled reaction and the mechanism of Oxidative phosphorylation? 14

Section-II

- Ques. 3 Explain the G- protein coupled receptor and describe phospholipid signaling mechanisms? 14
- Ques. 4 Explain the mechanism and role of the photosynthesis mechanism? 14

Section-III

- Ques. 5 Describe in detail: 7+7
- a) Discuss the process of nitrogen fixation, the enzymes involved, and their mechanisms of action?
- b) Interaction between nitrate assimilation and carbon metabolism.
- Ques. 6 Describe the mechanisms involved in nitrate absorption by plants and outline the biochemical steps of nitrate reduction to ammonia? 14

Section-IV

- Ques. 7 Write short notes on:
- a) Describe the various chemical forms of sulphur present in organisms and explain their essential roles in metabolism and physiological processes. 7
- b) Explain the structure, functions, and biological significance of glutathione and its related compounds. 7
- Ques. 8 Discuss the physiological roles of sulphur, the mechanisms by which it is absorbed from the soil, and the processes involved in its transport and distribution within plant tissues. 14

Exam Code: 225101

Paper Code: 1228

Programme: Master of Science (Botany) Semester – I

Course Title: Genetics and Evolution

Course Code: MBTL-1075

Time Allowed: 3 Hours

Max Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

Section- A

1. a) Briefly discuss the classical and molecular concept of gene. 7
 b) Distinguish between codominance and incomplete dominance with examples. 7
2. Write short note on:
 - a) Rolling circle model of DNA replication. 5
 - b) Watson-Crick model of DNA. 5
 - c) Initiation and primer problem in DNA replication. 4

Section- B

3. What are oncogenes? Discuss the biochemistry and molecular biology of cancer. 14
4. a) Briefly discuss the DNA repair mechanisms. 7
 b) What are induced mutations? Discuss the physical and chemical mutagenesis. 7

Section- C

5. Write short notes on:
 - a) Transposable elements in eukaryotes. 10
 - b) Somatic cell hybridization. 4
6. Comment on:
 - a) Repressible operon
 - b) Mechanism of attenuation 7+7

Section- D

7. Write brief notes on:
 - a) Inheritance pattern in autopolyploids 7
 - b) Evolutionary time scale 7
8. a) Discuss the Hardy-Weinberg Law in detail. 7
 b) What is speciation? Discuss different modes of speciation. 7

Exam Code: 225103

Paper Code: 3217

Programme: Master of Science (Botany) Semester III

Course Title: Developmental Botany

Course Code: MBTL-3071

Time: 3 Hrs.

Max. Marks: 70

Note: Attempt five questions in all, selecting one question from each section. Fifth question can be attempted from any section. Each question carries 14 marks.

SECTION-A

- Q1) Discuss various methods used to overcome self- and interspecific incompatibility in plant breeding programs. 14
- Q2) Explain the functions of pollen wall proteins and stigma surface proteins in pollen recognition and the regulation of compatibility responses. 14

SECTION-B

- Q3) Describe the events from the entry of the pollen tube into the ovule up to the fusion of gametes. 14
- Q4) Define Endosperm. Differentiate between the various types of endosperm according to their patterns of development. 14

SECTION-C

- Q5) a) Describe the polarization of the zygote and its significance in embryo development. 7
- b) Describe the technique and significance of embryo culture in rescuing hybrid embryos. 7
- Q6) What is a seed? Describe the structure and development of seeds in angiosperms. 14

SECTION-D

- Q7) Describe the diagnostic embryological characters used in plant taxonomy. 14
- Q8) a) Discuss the causes and consequences of endosperm dysfunction in hybrid seeds. 7
- b) Differentiate between primitive and advanced embryological characters with examples. 7

Exam Code: 225103

Paper Code: 3218

Programme: Master of Science (Botany) Semester III

Course Title: Plant Molecular Biology

Course Code: MBTL-3072

Time: 3 Hrs.

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 14 marks.

Section - A

Q1) Explain any two methods of DNA sequencing. What are the other names of Sanger sequencing method and Maxam-Gilbert method? 12, 2

Q2) Describe:

- a) RNA processing with diagram of spliceosomal splicing
- b) Transcriptional unit
- c) Promoter region

8, 3, 3

Section - B

Q3) Write about:

- a) Various types of endonucleases
- b) Host cell restriction
- c) Antibiotic resistance markers

6, 3, 5

Q4) Answer the following:

- a) Explain the process of Agarose gel electrophoresis.
- b) Write definition and functions of DNA ligase, Topoisomerases and Methylases.

8, 6

Section - C

Q5) Describe with diagram:

- a) Ti- plasmid
- b) Bacteriophage

7, 7

Q6) What are cloning vehicles? Give their features and importance with suitable examples.

2, 12

Section - D

Q7) Describe (with diagram/ flowchart, wherever required):

a) RFLP

b) PCR

7, 7

Q8) Write the definition, methods involved and applications of:

a) Protein profiling

b) Bioinformatics

7, 7

Exam Code: 225103

Paper Code: 3219

Programme: Master of Science (Botany) Semester III

Course Title: Plant Breeding and IPR

Course Code: MBTL-3073 ✓

Time: 3 Hrs.

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 14 marks.

Section A

1. What is sexual reproduction? Describe the process of gametogenesis in plant with the help of suitable diagrams.
2. Define domestication and briefly discuss the concept of centres of origin with the list of various centres of origin of cultivated plants.

Section B

3. Define heterosis. Discuss the physiological and molecular basis of heterosis and achievement in crop improvement.
4. Briefly describe the procedure of recurrent selection. Discuss the achievements through this method of breeding.

Section C

5. Briefly explain gene for gene relationship. Describe the backcross method of breeding for disease resistance governed by a recessive gene.
6. Explain the different types of correlation estimated in breeding materials and discuss their implications in plant breeding.

Section D

7. How to produce interspecific hybrid and briefly describe types of polyploidy and use in crop improvements.
8. Write short notes on the following:
 - a. Trade secrets and Trips
 - b. UPOV Acts and PPVFR act (2001)

Exam Code: 225103

Paper Code: 3220

Programme: Master of Science (Botany) Semester III

Course Title: Plant Biochemistry

Course Code: MBTL-3074

Time: 3 Hrs.

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 14 marks.

Section - A

- Q1. Explain the structure and properties of water, along with its biological importance? (14 marks)
- Q2. Explain in detail about Handerson-Haselbach equation? (14 marks)

Section - B

- Q3. Describe the glycolytic process along with its corresponding enzymes? (14 marks)
- Q4. Explain the role of acetyl coenzyme-A in cellular metabolism? (14 marks)

Section - C

- Q5. Describe the process of beta-oxidation of fats in plants? (14 marks)
- Q6. Explain the biosynthesis and regulation of cholesterol in plants? (14 marks)

Section - D

- Q7. Explain the mechanism of enzyme catalysis? (14 marks)
- Q8. Write brief notes on
- a) Specificity of enzyme and its types. (7 marks)
 - b) Enzyme induction and repression (7 marks)

Exam Code: 225103

Paper Code: 3221

Programme: Master of Science (Botany) Semester III

Course Title: Applied Botany

Course Code: MBTL-3075

Time: 3 Hrs.

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 14 marks. Draw labelled diagrams wherever necessary.

Section-A

1. Write notes on the following:
 - i) Spices and Condiments (5)
 - ii) Fruits (4)
 - iii) Fumitory substances (5)
2. Define beverages. Discuss the processing of Tea. (14)

Section-B

3. Discuss important commercial woods of India w.r.t their botanical characteristics, wood properties, and applications. (14)
4. Explain the industrial manufacturing of plywood and its classification based on their use. (14)

Section-C

5. Differentiate between essential oils and vegetable oils. Give classification, botanical description and uses of any two-essential oil yielding plants. (14)
6. Give classification of Fibres. Mention physical and chemical processes involved in manufacturing of fibres. (14)

Section-D

7. Describe the source of commercial rubber, the extraction of latex, its processing into rubber, and the various applications of rubber. (14)
8. What are natural dyes? Describe the methods of their extraction and discuss the advantages and disadvantages of plant-based dyes. (14)

Exam Code: 225103

Paper Code: 3222

Programme: Master of Science (Botany) Semester III

Course Title: Plant Morphogenesis

Course Code: MBTL-3076

Time: 3 Hrs.

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 14 marks.

Section – A

- Q1) a) Give a brief account on the genetical correlations in plants.
b) Explain the physiological manifestations of polarity. $7 \times 2 = 14$
Q2) How the polarity is expressed internally? Explain diagrammatically. 14

Section – B

- Q3) Explain the concept and types of symmetry in plants. 14
Q4) Define differentiation and explain the process of differentiation expressed internally in plants. 14

Section – C

- Q5) a) Discuss regeneration in higher plants.
b) Write a note on restoration and reconstitution. $7 \times 2 = 14$
Q6) Explain the role of somatic mutations in plant morphogenesis. Also, write a note on stock-scion relationships. 14

Section – D

- Q7) What are amorphous structure and how they are influencing plant morphogenesis. 14
Q8) Discuss the genetical and chemical factors affecting the development of plant morphogenesis. 14

Exam Code: 888891

Paper Code: 1287

Programme: Master of Computer Applications

Semester - I

Course Title: Design and Analysis of Algorithm

Course Code: MCAL-1121 ✓

Time Allowed: 3 Hours

Maximum Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

SECTION – A

- Q1.** What do you mean by algorithm design and analysis? Discuss the role of efficiency in algorithm design and explain the use of Big-O, Theta, and Omega notations with examples.
- Q2.** Explain following algorithms and also discuss their complexities:
- | | | |
|-------------------|------------------|-------|
| a) Insertion Sort | b) Binary Search | (7x2) |
|-------------------|------------------|-------|

SECTION – B

- Q3.** Explain the fundamental idea behind the Greedy Method. Illustrate its application by explaining the working of Prim's algorithm for finding a Minimum Spanning Tree.
- Q4.** Discuss the Dynamic Programming technique in algorithm design. Explain how the 0/1 Knapsack Problem can be solved using this approach.

SECTION – C

- Q5.** Define Backtracking and explain its role in problem-solving. Describe the procedure to find a Hamiltonian Cycle using the Backtracking method.
- Q6.** Explain the purpose of Amortized Analysis in algorithm design. Differentiate between the Aggregate Method and Accounting Method with appropriate examples.

SECTION – D

- Q7.** Explain the steps involved in performing Depth-First Search and Breadth-First Search traversals with examples.
- Q8.** Distinguish between the classes P, NP, NP-Hard, and NP-Complete. Discuss the relevance of NP-Complete problems.

Lib 28/11/25 K.M.V. (EVE)
Exam Code: 888891

Paper Code: 1288

Programme: Master of Computer Applications (Semester-I)

Course Title: Web Technologies

Course Code: MCAL-1122 ✓

Time Allowed: 3 Hours

Maximum Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

Section-A

1. What are markup languages, and how are they used in web development?
2. Explain the role of JavaScript in web development.

Section-B

3. What is Java servlet? Explain its lifecycle.
4. What are cookies and session tracking in server-side programming?

Section-C

5. Explain the concept of database connectivity using JDBC.
6. How does PHP handle file uploads and errors?

Section-D

7. What are advanced web technologies and tools? Explain.
8. What are middleware technologies in web development?

Exam Code: 888891

Paper Code: 1289

Programme: Master of Computer Applications

Semester - I

Course Title: Data Science Foundation

Course Code: MCAL-1123

Time Allowed: 3 Hours

Maximum Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

Section – I

1. What is the purpose of control structures and selection control structures in Python, explain with examples? What are nested conditions and when are they useful? 14
2. Explain various operators in Python along with their precedence order. 14

Section – II

3. A. What is meant by local and global scope in Python? Write a Python program to show the use of global and local variables. Also explain lambda functions and their usages. 7
B. Explain the concept of recursion with programming examples. 7
4. Explain tuples and dictionaries along with various operations and functions that can be applied on them. 14

Section – III

5. Explain concepts of OPPs through Python, write a Python program to create a class Student with attributes name, age, and marks etc. demonstrating the concept of class, methods, constructors and inheritance. 14
6. What is SQLite, and how is it used in Python? How do you create a new table using Python's sqlite3 module? Write code to insert records into a database table. How do you update and delete records in an SQLite database using Python? What is the purpose of the SQLite Manager Firefox Add-on? 14

Section -IV

7. What is Matplotlib, and why is it used for data visualization? Write Python code to plot a simple line graph. How do you label the x-axis, y-axis, and title in a Matplotlib plot? Write a program to plot multiple lines in the same graph. 14
8. What is SciPy, and how does it complement NumPy Name some commonly used SciPy submodules and their functions. Explain how scipy. stats can be used for statistical analysis. 14

Exam Code: 888891

Paper Code: 1290

Programme: Master of Computer Application

Semester - I

Course Title: Probability and Statistical Techniques

Course Code: MCAL - 1124

Time Allowed: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

Section-I

1. Calculate mean and standard deviation for the following data:

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
No. of students	5	10	20	40	30	20	10	4

2. From the following data, calculate Karl Pearson's coefficient of correlation between age and blindness:

Age	No. of Persons(in thousand)	Blinds
0-10	100	55
10-20	60	40
20-30	40	40
30-40	36	40
40-50	24	36
50-60	11	22
60-70	6	18
70-80	3	15

Section-II

3. i) A bag containing 5 white and 3 black balls. Two balls are drawn at random, one after another, with replacement. Find the probability that both balls drawn are black.
 ii) A bag contains 4 red balls, 3 white balls and 5 black balls. Two balls are drawn one after the other with replacement. Find the probability that first is red and the second is black.

4. i) Eight coins are tossed simultaneously. Find the chance of obtaining exactly 6 heads.
 ii) If there are 3 children in a family, find the probability that there is one girl in the family.

Section-III

5. 8 unbiased coins are tossed 256 times. Find the expected frequencies of success (getting a head) and tabulate the results obtained. Calculate the mean and standard deviations of the number of heads.
6. Net profit of 400 companies is normally distributed with a mean profit of Rs 150 lakhs and a standard deviation of Rs 20 lakhs. Find the number of companies whose profits (Rs lakhs) are
- less than 128
 - more than 175
 - between 100 and 138.

Also, find the minimum profit of the top 15% companies.

Section-IV

7. The following information relates to the wages of workers of two factories A and B.. Test whether there is any significant difference between their mean wages. Use $\alpha = .05$

	Factory A	Factory B
Mean wages	100	105
Standard Deviation	16	24
No. of workers	800	1600

8. i) In a hospital, 480 female and 520 male babies were born in a week. Do these figures confirm the hypothesis that males and females are born in equal numbers?
 ii) In a big city, 450 men out of a sample of 850 were found to be smokers. Does this information support the view that the majority of men in the city are smokers? Assume $\alpha = .05$

Exam Code: 888891

Paper Code: 1291

Programme: Master of Computer Applications

Semester – I

Course Title: Information Security

Course Code: MCAL-1125 (Opt-II)

Time Allowed: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting atleast one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

Section A

- Q1. What do you mean by Information Security? Explain various principles of Information Security with suitable illustrations?
- Q2. Explain the following with suitable illustrations:-
a) Access Control b) Non-repudiation

Section B

- Q3. Explain various threats to information security in detail.
- Q4. What do you mean by Asymmetric key encryption techniques? Explain any one with example.

Section C

- Q5. What do you mean by message authentication? How MAC is implemented for it?
- Q6. How a presentation is made attractive using graphics and smart art? Explain with the help of suitable examples.

Section D

- Q7. What do you mean by IDS? How an intruder is detected using Rule based IDS?
- Q8. What do you mean by firewall? Explain its characteristics and types along with their implementation.

Exam Code: 224701

Paper Code: 1214

Program: Master of Science (Chemistry) Semester – I

Course Title: Ligand Field Theory

Course Code: MCHL-1081

Time: 3Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks. Students can use non-programmable calculator.

SECTION-A

1. (a) How is group theory helpful in understanding σ and π bonding in square planar transition metal complexes? (7)
(b) Construct a group multiplication table for C_{2v} point group by taking ammonia as an example. (7)
2. (a) What are the rules relating to the determination of symmetry point group of a molecule? (7)
(b) Discuss in brief the quantitative splitting of s, p, d and f orbitals in octahedral ligand field. (7)

SECTION-B

3. (a) Illustrate the rules for determining the ground state terms for all configurations using L.S. scheme. (7)
(b) Discuss the σ and π bonding in square planar complex by constructing molecular orbital diagram. (7)

4. (a) On the basis of molecular orbital theory explain why $[\text{CoF}_6]^{3-}$ is paramagnetic whereas $[\text{Co}(\text{NH}_3)_6]^{3+}$ is diamagnetic in nature. (7)
- (b) What are electron repulsion parameters? Give their types. (7)

SECTION-C

5. (a) Discuss the utility and limitations of Orgel diagrams. (7)
- (b) Give an importance of Tanabe-Sugano diagrams. (7)
6. (a) How the selection rules are relaxed in centrosymmetric and non-centrosymmetric molecules. (7)
- (b) How you evaluate strong crystal field term of d^9 configuration in octahedral crystal field using group theory. (7)

SECTION-D

7. (a) Give comments on the spectra of $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$ and $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$. (7)
- (b) Write a short note on
 (i) Spectrochemical series
 (ii) Nephelauxetic effect (7)
8. (a) Discuss in detail the charge transfer spectra with suitable examples. (7)
- (b) Explain Orgel energy level diagram for octahedral and tetrahedral complexes having metal ion with d^2 and d^8 configuration. (7)

Exam Code: 224701

Paper Code: 1215

Program: Master of Science (Chemistry) Semester – I

Course Title: Organic Reaction Mechanism-I

Course Code: MCHL-1082 ✓

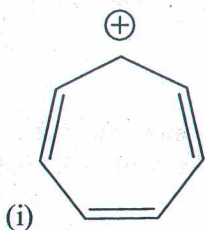
Time: 3Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks. Students can use non-programmable calculator.

SECTION-A

1. (a) What do you mean by aromaticity. Explain the aromaticity of annulenes and concept of homoaromaticity using appropriate examples? (7)
- (b) Explain the conditions for a compound to be an aromatic and antiaromatic. Justify how the following compounds are aromatic/antiaromatic compound?



2. (a) Describe asymmetric synthesis citing its relevance in organic synthesis. Also discuss enantioselective and diastereoselective synthesis of organic compounds with example? (7)
- (b) Explain Optical activity in absence of chiral carbon in organic compounds such as Biphenyls, Allenes, and Spiranes citing relevant examples. (7)

SECTION-B

3. (a) Discuss S_N1 and S_N2 mechanism in detail along with their stereochemistry? (7)

(b) Explain with examples neighbouring group participation by sigma and pi-bonds ? (7)

4. (a) Discuss with example kinetic and thermodynamic controlled reaction and difference between two by taking suitable examples? (7)

(b) Discuss in detail the different types of reaction intermediates formed in organic reactions along with their method of isolation? (7)

SECTION-C

5. (a) Discuss S_EI mechanism and also explain the effect of substrate, leaving group and solvent polarity on the reactivity of electrophilic substitution reactions? (7)

(b) Give detail overview of S_E2 (front and back) and diazo transfer reaction mechanism. (7)

6. (a) Discuss Classical, non-classical and phenonium cations, taking suitable examples? (7)

(b) Explain in detail nucleophilic substitution reactions occurring at allylic and aliphatic trigonal carbon. (7)

SECTION-D

7. (a) Explain reaction, mechanism and synthetic utility of Gattermann Koch reaction and Fries rearrangement reactions? (7)

(b) Discuss concept of ipso attack in aromatic electrophilic substitution reactions. (7)

8. (a) Explain aromatic nucleophilic substitution reaction *via* benzyne mechanism and give evidences in its support? (7)

(b) Explain reaction, mechanism and synthetic utility of Von Richter and Smiles rearrangement? (7)

Exam Code: 224701

Paper Code: 1216

Programme: Master of Science (Chemistry) Semester: I

Course Title: Physical Chemistry-Thermodynamics

Course Code: MCHL-1083

Time Allowed: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks. Students can use non-programmable calculator.

Section A

1. Derive Gibbs-Duhem equation. How is it used to obtain relationships of chemical potential with temperature and pressure? Obtain relationships of chemical potential with temperature and pressure? (14)
2. Explain the concept of partial molar properties and describe two methods used to determine them? (14)

Section B

3. (a) Develop an expression based on Debye-Hückel theory for strong electrolytes. (7)
(b) Using Debye-Hückel theory, demonstrate the relationship between the mean ionic activity coefficient and the ionic strength. (7)
4. What is the concept of activity? How is activity coefficient of electrolytic solutions determined? (14)

Section C

5. (a) Explain the concept of the partition function and derive an expression for internal energy and enthalpy in terms of the partition function. (7)
- (b) Develop an expression for the rotational partition function of an ideal diatomic gas. (7)
6. (a) Explain Fermi-Dirac statistics and discuss its applications in the study of metals. (7)
- (b) Derive an expression for the equilibrium constant of an ideal gaseous mixture using the partition functions of the reactants and products. (7)

Section D

7. Explain the phenomena of microscopic reversibility and Onsager's reciprocal relations. (14)
8. Discuss the following terms:
- i. Non-equilibrium stationary states (7)
 - ii. Coupled reactions. (7)

Exam Code: 224701

Paper Code: 1217

Programme: Master of Science (Chemistry) Semester I

Course Title: Spectroscopy – A: Techniques for Structure
Elucidation of Organic Compounds

Course Code: MCHL-1084

Time Allowed: 3 Hours

Max Marks: 70

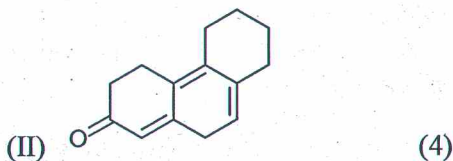
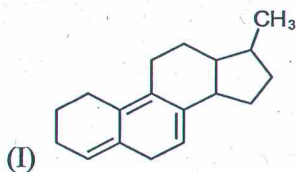
Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks. Students can use non-programmable calculator.

SECTION-A

- Q1 a) Discuss with diagrammatic representation Continuous wave measurement techniques in NMR spectroscopy. (7)
 b) What do you mean by diamagnetic anisotropy and explain why aromatic protons are more shielded than ethylenic protons. (7)
- Q2 a) Write note on nuclear magnetic double resonance and fluxional molecules in NMR spectroscopy. (7)
 b) Discuss the role of Lanthanide shift reagent in resolution of NMR spectra. (7)

SECTION-B

- Q3) a) Discuss with diagram the electron impact measurement technique in mass spectroscopy. (7)
 b) Explain Frank Condon Principle and its importance in Ultraviolet and Visible Spectroscopy. (7)
- Q4) a) Describe the conditions and importance of Retro- Diels – Alder fragmentation in mass spectroscopy with relevant examples. (3)
 (b) Calculate wavelength of the following using Woodward- Fieser rules?



- c) Discuss relative energies of different transitions noticed in UV spectrum of organic compounds and explain the effect of solvent on the U.V. spectrum absorption maxima of organic compounds. (7)

SECTION-C

- Q5) a) Describe with example the effect of bond angle and electronic effect on the vibrational frequency of organic compounds. (7)
 b) Discuss with examples various types of stretching and bending vibrations that occur in organic compounds in their Infra-red spectrum? (7)
- Q6) a) Explain various sampling techniques for handling the different samples in IR spectroscopy. (7)
 b) Discuss how you will determine purity of organic compound and study hydrogen bonding by Infra-red spectroscopy. (7)

SECTION-D

- Q7) a) An organic compound with molecular weight 54 is transparent to UV spectrum above 200 nm. In the IR spectrum, it shows bands at 3290, 2128 and 620 cm^{-1} . In its ^1H NMR spectrum, the following three signals are observed: 81.2 (triple, $J = 7.1$ cps), 1.5 (quartet, $J = 7.1$ cps) and 2.4 (singlet) in the intensity ratio 3 : 2 : 1, respectively. Determine the structural formula of the compound. (7)
 b) Molecular formula: $\text{C}_9\text{H}_{10}\text{O}_2$
 UV: λ_{max} 257 nm, ϵ_{max} 194.
 IR: Significant absorption bands at 3040, 2950, 1740, 1480, 1440 and 1220, 700 and 750 cm^{-1} .
 PMR: δ 1.96 (3H, s), 5.00 (2H, s) and 7.22 (5H, s).
 MS: Prominent peaks at *m/e* 150 (W), 108, 91, 79, 78 and 77. (7)
- Q8) a) A compound with molecular weight 130 gave a negative iodoform test. It absorbs at 292 nm, ϵ_{max} 16 in the UV spectrum. It shows significant bands at 3042, 2941, 2862, 2740, 1722, 1605, 1575 and 1462 cm^{-1} in its IR spectrum. In the PMR spectrum, three signals are present at δ 2.73 (multiplet), 7.2 (doublet) and 0.22 (triplet) in the intensity ratio 5 : 2 : 1, respectively. Determine the structural formula of the compound. (7)
 b) A compound with the molecular weight 116 gave the following spectral information:
 UV: λ_{max} 283, ϵ_{max} 22.
 IR: A very broad band in the region 2500-3000 cm^{-1} and a strong band at 1715 cm^{-1} .
 PMR: δ 2.12 (3H, s), 2.60 (2H, t), 2.25 (2H, t) and 11.1 (1H, s). (7)

Exam Code: 224701

Paper Code: 1218

Program: Master of Science (Chemistry) Semester – I

Course Title: Computer for Chemists

Course Code: MCHM-1135 ✓

Time: 3Hours

Max. Marks: 20

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 4 marks.

SECTION-A

1. Write short notes on the following:-

(a) Character set.

(b) Keywords.

(c) Identifier naming rules.

(d) Expressions. (4)

2. Define flowchart. What are the various symbols used in flowchart?

Write the purpose of each symbol. (4)

SECTION-B

3. What are the different types of operators available in C? Explain giving examples. (4)

4. Explain if and if-else statement with example. (4)

SECTION-C

5. What are the different types of loops in C? Explain giving examples of each type. (4)

6. Define functions. What are formal and actual parameters? Explain. (4)

SECTION-D

7. Define arrays. How two-dimensional arrays are declared and initialized? Explain giving example. (4)

8. Explain terms: break statement, strings, character arrays and array declaration. (4)

Exam Code: 224703
(20)

Paper Code: 3209

Programme: Master of Science (Chemistry)
Semester-III

Course Title: Inorganic Chemistry-II

Course Code: MCHL-3081 ✓

Time Allowed: 3 Hours

Max Marks: 70

Note: -- Attempt Five Questions, selecting at least one each from Sections A, B, C and D. The fifth question may be attempted from any Section. Each question carries 14 marks. Students can use non-Programmable calculator.

SECTION -A

1. (a) Provide a brief explanation of the model complexes of (a) Iron and (b) Cobalt. (7)
(b) What do you mean by essential trace elements? Discuss four specific elements in detail? (7)
2. (a) Illustrate the structures of Myoglobin and Hemoglobin. Discuss their roles in biological systems. (7)
(b) What is DNA Polymerase, and what role does it play in DNA replication? (7)

SECTION-B

3. (a) How would you define the term "enzyme"? Additionally, elaborate their functions in biological systems? (7)
(b) Draw and discuss the structure of Vitamin B₁₂ along with its role in Biological system? (7)
4. (a) Explain briefly the structure and functioning of Chlorophyll. (7)
(b) Write a short note on Phosphoglucomutase (3.5)
(c) Define the process of kinases (3.5)

SECTION-C

5. (a) What is transferrin, and how does it function within biological systems? Explain its mechanism? (7)
(b) Compose a brief note on Biochemistry of iron (7)
6. (a) What is the main difference between CN⁻ and CO poisoning. (3.5)
(b) Briefly discuss the Biological N₂ fixation. Discuss in detail *in - vivo* and *in - vitro* nitrogen fixation. – (7)
(c) Write a note on:
(i) Ferredoxin
(ii) Rubredoxin (3.5)

SECTION-D

7. (a) What is the role of SODs in biological system. Draw and briefly describe the mechanism of Cu-Zn SODs. (7)
- (b) Explain the transport and regulation of calcium in living cell with the help of calcium pump. (7)
8. (a) Write a brief note on Chelate therapy? (5)
- (b) Antibiotics are important for treatment of various diseases but they also pose toxic effect, explain and also discuss toxic effect of antibiotics. (9)

Exam Code: 224703
(20)

Paper Code: 3210

Programme: Master of Science (Chemistry)
Semester-III

Course Title: Organic Synthesis

Course Code: MCHL-3082

Time Allowed: 3 Hours

Max Marks: 70

Note: - Attempt Five Questions, selecting at least one each from Sections A, B, C and D. The fifth question may be attempted from any Section. Each question carries 14 marks.

Students can use Non-programmable calculator.

SECTION-A

1. (a) Describe the mechanism involved in the Baeyer-villiger rearrangement. (7)
(b) Provide a detailed synthesis of fluorene and phenanthrene, and discuss their aromaticity, justifying your answer. (7)
2. (a) Discuss the Pinacol-pinacolone and Neber mechanism in detail using appropriate examples? (7)
(b) Explain the Favorskii rearrangement, including its mechanism. (7)

SECTION-B

3. (a) Describe three synthetic routes for furan. Compare the aromaticity of furan, thiophene, pyrrole, benzene and discuss their order of reactivity based on this aromatic character? (7)
(b) Outline the preparation methods for thiiranes and discuss their chemical properties? (7)
4. (a) Write the synthesis methods for thiepinines and thiazepines along with its chemical reactions? (7)
(b) Detail the dicarbonyl and Hantzsch synthesis of pyridine and explain why it has lower reactivity towards substitution reactions? (7)

SECTION-C

5. (a) Define Merrifield solid-phase peptide synthesis. Why are protecting groups used during this process? (7)
(b) Discuss osmium tetroxide catalyst and its various applications in detail. (7)
6. (a) What are phase transfer catalysts (PTCS)? Explain their mechanistic pathway and their importance in organic chemistry. (7)
(b) Provide a detailed explanation of the following reagents:
(i) Peterson's synthesis
(ii) Lithium aluminium hydride (7)

SECTION-D

7. (a) Describe the synthesis and structure of crown ethers and cryptands and explain how their structure influences host selectivity? (7)
(b) Explain the concepts of thermodynamic and kinetic selectivity in the context of supramolecular chemistry? (7)
8. (a) Discuss the various types of intermolecular forces found in supramolecular compounds. (7)
(b) Define cyclotrimeratrylene, explain in detail the synthetic route and applications in carrying out various synthesis? (7)

Exam Code: 224703

Paper Code: 3211

Programme: Master of Science (Chemistry) Semester III

Course Title: Surface and Polymer Chemistry

Course Code: MCHL-3083

Time: 3 Hrs.

Max. Marks: 70

Note: Attempt one question from each section and fifth question can be attempted from any section. Each question carries 14 marks. Students can use non-programmable calculator.

SECTION - A

1. (a) Derive an expression for vapour pressure of droplets (Kelvin equation).
(b) Write a short note on capillary action. (7, 7)
2. (a) Is adsorption an exothermic or endothermic process? Justify your answer thermodynamically.
(b) Define detergent action of soaps.
(c) What is the mathematical expression for Gibbs Adsorption isotherm? (3, 4, 7)

SECTION - B

3. (a) Derive an expression for phase separation model.
(b) Differentiate between emulsion and microemulsion. (7, 7)
4. (a) Outline the characteristic features of surface-active agents.
(b) Describe various factors affecting the CMC. (7, 7)

SECTION - C

5. (a) Describe light scattering method for the determination of molecular mass of a polymer.
(b) Explain the difference between the following by giving suitable example: -
 - Addition and condensation polymerization
 - Thermosetting and thermoplastic polymers (7, 7)

6. Explain (a) liquid crystal polymer
(b) Conducting polymer

(7, 7)

SECTION - D

7. Elaborate the following

- (a) Chain topology
- (b) Chain flexibility
- (c) Co-polymerization
- (d) T_m - T_g Relationship

(3.5 X 4 = 14)

8. (a) Give an account of glass transition temperature.

- (b) Highlight the physical properties of solid polymer with special emphasis on their crystalline, elastic and plastic nature.

(7, 7)

Exam Code: 224703

Paper Code: 3212

Programme: Master of Science (Chemistry) Semester III

Course Title: Photochemistry and Pericyclic Reactions

Course Code: MCHL-3084 ✓

Time: 3 Hrs.

Max. Marks: 70

Note: Attempt one question from each section and fifth question can be attempted from any section. Each question carries 14 marks. Use of non-programmable calculator is allowed.

Section A

Q1) a) What are correlation diagram? Draw correlation diagram for allyl cation and allyl anion system. (7)

(b) Discuss Woodward Hoffmann selection rules for sigmatropic carbon shift of order [1,3] with the help of orbital picture diagram. (7)

Q2) (a) Explain the Perturbation of Molecular Orbital (PMO) approach for thermal and photochemical conditions with the help of suitable example. (7)

(b) Discuss the concept of suprafacial and antarafacial interactions in cycloadditions with examples of (4+2) reactions. (7)

Section B

Q3) (a) Describe [1,3]-sigmatropic rearrangements and explain the concept of retention and inversion of configuration. (7)

(b) Explain Ene reactions and fluxional tautomerism by citing relevant examples. (7)

Q4) (a) What are electrocyclic reactions? Explain the conrotatory and disrotatory opening of 1,3 butadiene with orbital picture diagram. (7)

(b) Describe cheletropic reactions and aza-Cope rearrangement mechanisms. (7)

Section C

Q5. (a) Explain energy transfer mechanisms in photochemical processes. (7)

(b) Describe the effect of light intensity on the rate of photochemical reactions. (7)

Q6. (a) Classify photochemical reactions and describe photodissociation with examples. (7)

(b) Explain gas-phase photolysis and its kinetic characteristics. (7)

Section D

Q7. (a) Discuss intramolecular reactions of α,β -unsaturated and β,γ -unsaturated carbonyl compounds. (7)

(b) Explain intermolecular cycloaddition reactions leading to oxetane formation. (7)

Q8. (a) Describe the Photo-Fries rearrangement and its mechanism. (7)

(b) Explain the Barton reaction and photochemistry of vision in humans. (7)

Exam Code: 225801
(30)

Paper Code: 1259

Programme: Master of Commerce
Semester-I

Course Title: Management Accounting and Control
Systems

Course Code: MCML-1092 ✓

Time Allowed: 3 Hours

Max Marks: 70

Note:- Attempt FIVE questions selecting at least ONE question from each section. The Fifth question be attempted from any section. Each question carries 14 marks.

SECTION-A

1. Discuss in detail the Generally Accepted Accounting Principles and Concepts. 14
2. Explain the relationship between Management Control, Strategic Planning and Operational control. 14

SECTION —B

3. Explain the concept of Responsibility Accounting. Discuss the various forms of responsibility centres. 14

4. Write notes on
(i) Fixed and Flexible Budgets
(ii) Performance and Participative Budgets 14

SECTION —C

5. What do you mean by Variance Analysis? Explain in detail various Kinds of Variances and their uses. 14
6. From the following data, you are required to calculate:
(a) P/V ratio
(b) Break-even sales with the help of P/V ratio.
(c) Sales required to earn a profit of Rs 4,50,000
Fixed expenses = Rs 90,000
Variable Cost per unit:
Direct Material =Rs 5
Direct Labour = Rs 2
Direct Overheads = 100 % of Direct Labour
Selling price per unit =Rs 12

14

SECTION —D

7. Explain various methods of Segment Performance Evaluation. 14
8. What do you mean by Reporting to Management? Explain the different types and modes of reporting at various levels of Management. 14

Exam Code: 225801
(30)

Paper Code: 1260

Programme: Master of Commerce
Semester-I

**Course Title: Management Principles and
Organisation Behaviour**

Course Code: MCML-1093 ✓

Time Allowed: 3 Hours

Max Marks: 70

Note:- Candidates are required to attempt five questions, selecting one question from each section. The fifth question may be attempted from any section. Each question carries 14 marks.

SECTION-A

1. Explain the nature and purpose of Management. 14
2. What is the need for Departmentation? Discuss the various bases of departmentation. 14

SECTION-B

3. Explain Vroom's Expectancy theory of Motivation. 14
4. Define Leadership. Explain the Path-Goal Theory of leadership in detail. 14

SECTION-C

5. Define Personality. Discuss the various determinants of personality. 14
6. Write short notes on:
 - a) Types of Attitudes 7
 - b) Cognitive Dissonance Theory 7

SECTION-D

7. Define Perception. Explain the reasons for perceptual distortions. 14
8. Write short notes on:
 - a) Sources of Emotions 7
 - b) Concept of Emotional Intelligence 7

**Exam Code: 225801
(30)**

Paper Code: 1261

**Programme: Master of Commerce
Semester-I**

Course Title: Business Environment

Course Code: MCML-1094

Time Allowed: 3 Hours

Max Marks: 70

Note: Attempt 5 questions, selecting at least 1 question from each section. The fifth question may be attempted from any section. Each question carries equal (14 marks).

Section-A

1. Explain the features, advantages and disadvantages of Capitalist Economic System.
2. Discuss the LPG Policy in brief.

Section-B

3. Differentiate between NITI Aayog and Planning Commission. Explain the role of economic planning in India.
4. Explain the rationale and dimensions of Social Responsibility of Business.

Section-C

5. Explain the salient features of FEMA.
6. Analyse the current year Annual Budget.

Section-D

7. Explain the concept of Consumerism and role of consumer groups with special reference to India.
8. Explain Foreign Trade Policy 2009-14.

Exam Code: 225801
(30)

Paper Code: 1262

Programme: Master of Commerce
Semester-I

Course Title: Statistical Analysis for Business

Course Code: MCMM-1095 ✓

Time Allowed: 3 Hours

Max Marks: 50

Note 1: Candidates are required to attempt five questions, selecting at least one from each Section. The fifth question may be attempted from any section. Each question carries 10 marks.

Note 2: Simple calculator is allowed.

Note 3: Statistical tables can be used.

Section-I

1. (a) Explain the following terms:
 - (i) Equally Likely events 3
 - (ii) Classical definition of probability 3
- (b) A bag contains 7 white and 9 black balls. Two balls are drawn randomly. Find out the probability that (a) both are white (c) both are black. 4

2. Discuss in detail the properties of normal distribution.

10

Section-II

3. (a) What are the sampling and non sampling errors?
Explain the reasons for these errors. 5

(b) Define the followings:

(i) Quota Sampling

(ii) Convenience sampling 5

4. Differentiate between primary and secondary data.
Discuss various methods of collecting primary data.

10

Section-III

5. How a questionnaire can be utilized to collect data?
Discuss various essentials of drafting a questionnaire.

10

6. (a) Discuss in detail the concept of type I and type II errors. 5

(b) Differentiate between null and alternative hypothesis 5

Section-IV

7. Intelligence test on two groups of boys and girls gave the following results:

	Mean	SD	N
Girls	75	15	150
Boys	70	20	250

Is there any significant difference in the mean score obtained by boys and girls? 10

8. Calculate Karl Pearson's coefficients of Correlation from the following data:

X	24	27	28	28	29	30	32	33	35	35	40
Y	18	20	22	25	22	28	28	30	27	30	22

10

**Exam Code: 225801
(30)**

Paper Code: 1258

**Programme: Master of Commerce
Semester-I**

Course Title: Managerial Economics

Course Code: MCML-1171 ✓

Time Allowed: 3 Hours

Max Marks: 70

Candidates are required to attempt five questions, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

Section-I

1. State the nature and scope of managerial economics.
How the knowledge of managerial economics is useful
in actual business decision making? 14
2. Describe different concepts of elasticity of demand. Also
explain the point method of measuring price elasticity
of demand. 7,7

Section-II

3. Explain consumer's equilibrium with the help of
Indifference Curve Analysis. Examine the effect of
change in price on consumer's equilibrium. 9,5

4. Define the law of variable Proportions. Explain its different stages with the help of suitable table and diagram. 4,10

Section-III

5. Explain Modern Theory of short run costs. How does it differ from Traditional theory of costs. 10,4
6. Critically examine Sweezy's Model of firm behaviour under oligopoly. 14

Section-IV

7. Explain product method of measurement of National Income. Also describe the importance of measurement of National Income. 9,5
8. Critically explain Keynesian Psychological Law of consumption. 14

Exam Code: 225803

Paper Code: 3247

Programme: Master of Commerce

Semester: III

Course Title: Banking and Insurance Services

Course Code: MCML-3091 ✓

Time Allowed: 3 Hours

Max. Marks: 70

Note: Attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 14 marks.

SECTION-A

1. Define Asset liability management. Discuss the objectives and implications of Asset liability Management. (14)
2. Explain the following innovations in banking :
 - a) Internet banking
 - b) Universal banking
 - c) Phone banking
 - d) Offshore banking(4 X 3.5 = 14)

SECTION-B

3. What do you mean by priority sector lending? Explain different sectors for priority sector lending. (14)
4. Explain BASEL Norms in detail. (14)

SECTION-C

5. Explain salient features of IRDA. (14)
6. Define Insurance. Explain the role of insurance industry in India. (14)

SECTION-D

7. What do you mean by surrender value? Explain the various methods of calculating surrender value. (14)
8. Discuss various insurance documents. (14)

**Exam Code: 225803
(30)**

Paper Code: 3248

**Programme: Master of Commerce
Semester-III**

**Course Title: Group B: Business Studies (Strategic
Management)**

**Course Code: MCML-3092
(Opt-BI)**



Time Allowed: 3 Hours

Max Marks: 70

Attempt 5 questions selecting atleast one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

Section A

1. What is strategic management? What are its basic features? 14
2. Define strategic intent? How are mission statements formulated and communicated? What are the characteristics of a good mission statement? 14

Section B

3. What is environmental scanning? Explain the techniques of environmental scanning? 14

4. What is external environment analysis? Discuss Porter's five forces model? 14

Section C

5. Explain the following:
- a. Retrenchment Strategies 3.5
 - b. Related and Unrelated diversification 3.5
 - c. Growth Strategies 3.5
 - d. Strategic Outsourcing 3.5
6. Explain the BCG Model in detail? 14

Section D

7. What is corporate governance? Explain the role of SEBI in corporate governance? 14
8. What are the various techniques of strategic control? Explain each of them with suitable example. 14

**Exam Code: 225803
(30)**

Paper Code: 3249

**Programme: Master of Commerce
Semester-III**

**Course Title: Group B: Business Studies
(Security Market Operations)**

**Course Code: MCML-3093
(Opt-BII)**

Time Allowed: 3 Hours

Max Marks: 70

**Important Note: Attempt 5 questions each carry 14 marks.
Attempt one question from each section. The fifth question
may be attempted from any section.**

Section-A

1. Discuss the functions of primary and secondary market.
How they contribute to growth of an economy.
2. Discuss provisions related to listing of securities in India in
detail.

Section- B

3. Discuss need and importance of Indian Stock Indices.
4. What do you mean by Derivative market? Discuss various
products of derivative market.

Section -C

5. Explain the powers and functions of SEBI in detail. How they regulate securities market?
6. Explain the concepts:
 - a) Internet trading system
 - b) Investor redressal mechanism

Section-D

7. What do you mean by Mutual funds. How they are regulated in India?
8. Explain the concepts:
 - a) procedure to open Demat and Trading Account
 - b) Role of CDSL

Exam Code: 225803

Paper Code: 3250 - R

Programme: Master of Commerce (Semester – III)

Course Title: Group D: Marketing (Consumer Behaviour)

Course Code: MCML-3094 (Opt. – DI)

Time Allowed: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one from each section.
Fifth question may be attempted from any section. Each question carries 14 marks.

Section – A

1. (a) Explain the scope and relevance of studying consumer behaviour for marketers.
(b) Discuss the types of consumer needs and how conflicts between them influence buying decisions.
2. (a) What is Psychographics? Explain its role in segmenting consumers.
(b) Evaluate the application of Self-image theory in branding with examples.

Section – B

3. Explain the concept of Selective Perception and its implications for marketing communications.
4. (a) What are attitudes? Discuss the Tri-component model of attitudes and its usefulness for marketers.
(b) Describe how consumers learn to prefer certain brands over others using Operant Conditioning theory.

Section – C

5. Describe the role of Family Lifecycle in shaping consumption patterns. How does it affect marketing strategy formulation?
6. Discuss how Social Class and Reference group appeal jointly influence consumer choices. Support your answer with relevant examples.

Section – D

7. (a) Explain the adoption process in Diffusion of Innovation.
(b) Discuss Nicosia's model of consumer behaviour and its marketing relevance.
8. A clothing brand aims to enter the premium ethnic wear segment. Suggest a consumer decision-making framework that could help understand buyer behaviour and plan marketing communication accordingly.

**Exam Code: 225803
(30)**

Paper Code: 3250

**Programme: Master of Commerce
Semester-III**

**Course Title: Group D: Marketing (Consumer
Behaviour)**

**Course Code: MCML-3094
(Opt-DI)**

Time Allowed: 3 Hours

Max Marks: 70

Note:- Attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. Each question carries 14 marks.

Section A

1. What is the scope of Consumer Behavior? What are the advantages of studying Consumer behavior?
2. Describe the trait theory and explain how it led to the implications of concept of personality to brands.

Section B

3. Discuss consumer learning in detail.
4. How are attitude formed? Describe the different strategies by which attitude can be changed

Section C

5. What is social class? Describe the methods of measuring social class and also explain how social class affects consumer behavior.
6. What is culture? Why is it important to study the role of culture in consumer behavior?

Section D

7. Discuss the stages involved in consumer buying process.
8. Explain Nicosia model and how does it differ from E.K.B. model?

Exam Code: 225803

Paper Code: 3251 - R

Programme: Master of Commerce Semester III

Course Title: Retail Management

Course Code: MCML-3095 (Opt-DII)

Time Allowed: 3 Hours

Max. Marks: 70

Note: Attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. Each question will carry 14 marks.

Section - A

- Q1. Discuss the evolution of retail in India in the light of various drivers of retail change. What are the various challenges to retail development in India?
- Q2. Explain the different types of organized retail format with suitable examples.

Section - B

- Q3. Describe the shopping decision process by the customers in retail sector.
- Q4. Discuss exterior and interior store design. What components must be considered while planning store design?

Section - C

- Q5. Discuss the role of buyer and merchandiser in the process of merchandising by a retail organization.
- Q6. What is merchandise planning? Discuss the various implications of merchandise planning in detail.

Section - D

- Q7. What elements must be considered while deciding retail price? Discuss various retail pricing strategies.
- Q8. Discuss the advantages and disadvantages of franchising for a retail organization.

Exam Code: 225803
(30)

Paper Code: 3251

Programme: Master of Commerce
Semester-III

Course Title: Group D: Marketing (Retail Management)

Course Code: MCML-3095
(Opt-DII)

Time Allowed: 3 Hours

Max Marks: 70

Note: Students are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. Each question carries (14) marks.

Section —A

1. Discuss the nature and importance of retailing in detail.
2. Discuss the various factors that facilitated the growth of retail in India. Also explain various challenges faced by retail industry in India.

Section -B

3. What is the importance of location analysis before opening any retail store? Explain various factors affecting the retail location planning?

4. Explain various principles of display in detail. Discuss various elements of visual merchandising along with examples.

Section -C

5. What is retail merchandising? Discuss various factors affecting buying function in a retail organization.
6. What is merchandise planning? Explain its process in detail.

Section -D

7. Explain various methods of merchandise procurement along with their advantages and disadvantages.
8. Critically evaluate the role of assortment and category management for a retailer.

Exam Code: 223703

Paper Code: 3264

Programme: Master of Science (Computer Science) Semester III

Course Title: Data Mining and Data Warehousing

Course Code: MCSL-3111

Time Allowed: 3 Hours

Max. Marks: 70

Note: Candidates are required to attempt 5 questions selecting at least one question from each section. Fifth question can be attempted from any section. Each question carries 14 marks.

(Section-A)

1. Explain Data Mining also explain how one can use the predictive modelling for data modelling for data mining.
2. Compare and contrast supervised and unsupervised learning. Give examples of algorithms used in both approaches.

(Section-B)

3. Discuss various problems with Data Warehousing. Explain mapping the data warehousing to Multi-process Architecture.
4. Is it necessary that every small and big company should have a data warehousing. Justify your answer? Differentiate between OLAP and OLAM.

(Section-C)

5. Define Data mining and also write down the different types of Data Mining techniques with suitable example.
6. Define clustering. Why clustering is important in Data Mining? Write its uses.

(Section-D)

7. Explain Data Mining Query Language with syntax/query of at least three tasks.
8. Write down the current trends used in data mining. Explain the various applications areas where data mining is used.

Exam Code: 223703

Paper Code: 3265

Programme: Master of Science (Computer Science) Semester III

Course Title: System Software

Course Code: MCSL-3112

Time Allowed: 3 Hours

Max. Marks: 70

Note: Candidates are required to attempt 5 questions selecting at least one question from each section. Fifth question can be attempted from any section. Each question carries 14 marks.

Section - A

1. What is software? Explain different components of system software. 14
2. Write short notes on:
 - Loader
 - Translator2 X 7 = 14

Section - B

3. Explain in detail the working of two pass assemblers with an algorithm. 14
4. What is a macro? How can a macro be created? Discuss the conditional macro expansion in detail? 14

Section - C

5. What is a compiler? Explain different phases of the compiler. 14
6. What is code optimization? Why can it be used? Explain different techniques that can be used for code optimization. 14

Section - D

7. What is a loader? Explain different types of loader in detail. How can a program be linked? 14
8. Write a note on:
 - Operating System
 - Text Editor2 X 7 = 14

Exam Code: 223703

Paper Code: 3266

Programme: Master of Science (Computer Science) Semester III

Course Title: Advanced Web Technologies

Course Code: MCSL-3113

Time Allowed: 3 Hours

Max. Marks: 70

Note: Candidates are required to attempt 5 questions selecting at least one question from each section. Fifth question can be attempted from any section. Each question carries 14 marks.

Section - A

- Q1. Write ASP.NET validation controls with examples. 14
Q2. Explain Radio button and checkbox controls with examples. 14

Section - B

- Q3. a) Write a code to explain different page views in ASP.NET.
b) How can load master pages dynamically? 9, 5
Q4. Explain different ASP.NET parameters used with SQL data source control. 14

Section - C

- Q5. Explain various fields that are used with Grid view control. 14
Q6. Explain Drop down list and Radio button controls with examples. 14

Section - D

- Q7. What do you mean by Cookies? Explain Browser and session cookies. 14
Q8. Write a note on following:
a) Page output caching
b) ADO.NET
c) Caching
d) Validation Summary 4 X 3.5 = 14

Lib 16/12/25 KMV-1 (EVE)

Exam Code: 223703
(20)

Paper Code: 3267

Programme: Master of Science (Computer Science)
Semester-III

Course Title: Design and Analysis of
Algorithms

Course Code: MCSL-3114 ✓

Time Allowed: 3 Hours

Max Marks: 70

Note: There are four sections, each having 2 questions. Attempt five questions, selecting atleast one from each section. All the questions carry equal marks(14 each). Fifth question can be attempted from any section.

Section — A

1. (a) What is an algorithm? Explain Worst case, Best case and Average case complexity of an algorithm. 7
(b) What do you mean by asymptotic notations? Explain Big O notation and omega notation. 7
2. (a) How maximum and minimum is found using "Divide and Conquer" technique? Explain. 7
(b) Explain quick sort algorithm along with complexity. 7

Section — B

3. (a) Generate minimum cost spanning tree using Kruskal's algorithm. 9
(b) Demonstrate Knapsack problem along with example. 5
4. (a) How the problem is solved-using greedy method? Explain various issues also. 7
(b) How single-source shortest path is implemented to solve problem? Explain using example. 7

Section — C

5. What is 0/1 Knapsack problem? Describe by giving an example, how 0/1 Knapsack problem can be solved using dynamic programming technique of designing and algorithm. 14
6. Explain how to solve traveling salesman problem by the method of dynamic programming. 14

Section — D

7. (a) How graph coloring is solved using Backtracking? Explain. 7
(b) How an item is searched in Binary trees? Explain. 7
8. Explain the use of Backtracking method of solving four queens problem giving its algorithm. (14)

Exam Code: 223703

Paper Code: 3268

Programme: Master of Science (Computer Science) Semester III

Course Title: Software Testing

Course Code: MCSL-3115

Time Allowed: 3 Hours

Max. Marks: 70

Note: Candidates are required to attempt 5 questions selecting at least one question from each section. Fifth question can be attempted from any section. Each question carries 14 marks.

Section - A

1. What do you mean by defects? Explain their origin and cost. 14
2. What do you mean by Software Testing? Explain general Principals of Software Testing. 14

Section – B

3. A. Explain control flow testing technique with examples. 7
- B. What do you mean by reviews in software testing? Explain review process. 7
4. A. Explain Boundary value technique with examples. 7
- B. Explain difference between white box testing and black box testing in detail. 7

Section – C

5. Explain UML class diagram and sequence diagrams with examples. How they are useful in software testing? 14
6. Explain various issues in involved Object Oriented Testing? 14

Section – D

7. A. Explain Regression testing. Explain various techniques for achieving Regression testing. 7
- B. Explain the terms test planning and test strategies. 7
8. Explain Software Test Automation? What are various skills required for Software Test Automation? 14

Exam Code: 509601

Paper Code: 1263

Programme: Master of Science (Economics) Semester - I

Course Title: Microeconomic Theory-I

Course Code: MECL-1171 ✓

Time Allowed: 3 Hours

Maximum Marks: 70

Note: - Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

Section – A

1. Bring out clearly the implications of Asymmetric Information.
2. Compare Indifference Curve Analysis of Demand with Marshallian Cardinal Utility Analysis. Which do you think is superior?

Section – B

3. Explain the Cobb-Douglas Production Function and its properties.
4. Explain the law of diminishing returns. Why this law generally applies to agriculture?

Section – C

5. Explain the traditional theory of costs both in short run and long run with the help of suitable diagrams.
6. Discuss the features of a Perfectly Competitive market and explain firm's equilibrium under perfect competition in the short period.

Section – D

7. How can there be, according to Marris, the maximization of balanced rate of growth?
8. Price under Bilateral monopoly is indeterminate. Discuss.

Exam Code: 509601

Paper Code: 1264

Programme: Master of Science (Economics) Semester - I

Course Title: Macroeconomic Theory-I

Course Code: MECL-1172

Time Allowed: 3 Hours

Maximum Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

Section – A

1. Distinguish between Gross Domestic Product (GDP) and Gross National Product (GNP). How do net factor income from abroad and other components help in converting domestic product into national product? Discuss the significance of this distinction for policy formulation and economic analysis.
2. Critically examine the distinction between real and nominal GNP and evaluate whether GNP serves as a true measure of economic welfare, considering its limitations and the need for broader indicators of development.

Section – B

3. Classical economists considered inflation to be caused by growth of money supply, output being constant at full-employment level, while Keynes showed that inflation was caused by excess of aggregate demand for goods and services over their aggregate supply. Discuss.
4. Using IS-LM model, show that fiscal policy is more effective at low rate of interest and low level of income, while monetary policy is more effective when the levels of income and rate of interest is high.

Section – C

5. Explain Duesenberry, relative income hypothesis of consumption behaviour. How does it reconcile long run consumption function with the cyclical consumption function?
6. What is relative income hypothesis? How does it differ from Keynes' absolute income hypothesis? How is permanent income measured?

Section – D

7. Discuss Tobin Model of Money demand along with Post-Keynesian modification.
8. Examine the role of the Real Balances Effect in restoring equilibrium under conditions of unemployment as proposed by Patinkin. How does it differ from the Keynesian view on money and prices? Evaluate its theoretical and practical implications for modern macroeconomic analysis.

Exam Code: 509601

Paper Code: 1265

Programme: Master of Science (Economics) Semester -I

Course Title: Statistical Techniques

Course Code: MECL-1173 ✓

Time Allowed: 3 hours

Max. Marks: 70

Note: Attempt five questions in all, selecting atleast one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

Section-A

1. a) Calculate the coefficient of correlation between size and defectiveness.

Size	5	6	7	8	9	10
No. of Items	200	270	340	360	400	300
No. of Defectives	200	162	170	180	180	120

b) $r_{12}=0.6$ $r_{13}=0.7$ $r_{23}=0.5$

Find out $r_{12.3}$, $r_{13.2}$, $r_{23.1}$ and $R_{1.23}$

2. a) $3X+4Y=23$

$5X+8Y=41$

Find means of X and Y, regression coefficients and r

- b) Discuss the properties of regression coefficients

Section-B

3. Fit the multiple linear regression of X_1 on X_2 and X_3 from the following data :

X_1	5	6	8	7	4	3	2
X_2	10	12	13	15	11	16	17
X_3	20	22	21	24	23	26	27

- 4 a) Fit a second-degree parabolic trend.

Supply	6	8	5	11	14
Price(Rs.)	5	7	4	9	12

- b) Explain briefly the modified exponential curve.

Section-C

5. a) In a single throw of dice, what is the probability of getting a total of 7 or 9?
 b) A problem of statistics is given to three students- A, B, and C whose chances of solving are $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{4}$. What is the probability that the problem will be solved?

6. a) The probability distribution of profits is as follows

Profits	100	200	300	400
P(x)	0.3	0.2	0.4	0.1

Find the expected profits.

- b) Define the moment generating function and discuss its main properties

Section-D

7. Write down the various methods of sampling and their suitability.
8. a) Explain the properties of normal distribution.
 b) A fair coin is tossed six times. What is the probability of obtaining four or main heads?

Exam Code: 509601

Paper Code: 1266

Programme: Master of Science (Economics) Semester - I

Course Title: Public Economics

Course Code: MECL-1174

Time Allowed: 3 Hours

Maximum Marks: 70

Note: - Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

Section – A

1. What does Arrow's Impossibility Theorem state, and what are the key conditions it outlines, including unrestricted domain, non-dictatorship, Pareto efficiency, and independence of irrelevant alternatives?
2. What are the key characteristics of public goods in public economics, and how do these characteristics affect their provision and funding by the government?

Section – B

3. What is public revenue, and what are the various sources through which it is generated? Explain in detail the different channels through which the government collects revenue.
4. What is taxable capacity, and how is it determined? Furthermore, what are the essential characteristics of a well-designed and efficient tax system?

Section – C

5. "Cost-benefit analysis is a widely used methodology designed to help public authorities make informed and rational decisions regarding public expenditure." Critically examine the accuracy of this statement.
6. How does the **ratchet effect** impact government spending, wages, and inflation, and what are the potential long-term economic consequences of this phenomenon?

Section – D

7. What are the fundamental principles of federal finance, and what are the reasons behind the occurrence of fiscal non-correspondence in a federal system?
8. "As a stabilization measure, fiscal policy is far more effective than monetary policy". Do you agree with this view?

Exam Code: 509601

Paper Code: 1267

Programme: Master of Science (Economics) Semester –I

Course Title: Financial Institutions and Markets

Course Code: MECL-1175 (Opt-I) ✓

Time Allowed: 3 Hours

Maximum Marks: 70

Note: Candidates are required to attempt five questions, selecting atleast one question from each section. The fifth question may be attempted from any section. Each question carries 14 marks.

Section A

1. Discuss the evolution and changing role of development financial institutions.
2. What was the need for setting up small industrial Development Bank of India (SIDBI)? How far has it be successful in achieving its objectives?

Section B

3. Explain the role and objectives of NBFCs registered with RBI classified on the basis of their activities.
4. "Mutual funds are good source of investment". Discuss the statement by highlighting the major categories of mutual fund schemes along with their benefits.

Section C

5. Critically discuss banking sector reforms in India in the light of Narasimham's committee Reports (1991 and 1998).
6. Discuss in detail the instruments of Reserve Bank of India in controlling liquidity in the economy.

Section D

7. What is treasury bill? Explain the types, nature and characteristics of treasury bills market in India.
8. Discuss the role and structure of Capital market in India. What are various reforms of Indian capital market?

Exam Code: 509603

Paper Code: 3252

Programme: Master of Science (Economics) Semester III

Course Code: MECL-3171 ✓

Course Title : Microeconomic Theory-II

Time: 3 Hours

Max. Marks: 70

Note: Attempt five questions, selecting one from each section. The fifth question can be attempted from any section. Each question carries 14 marks.

Section-A

- Q1. Explain the marginal productivity theory of distribution.
- Q2. Define and explain Euler theorem

Section-B

- Q3. What is dominant strategies? And explain Nash equilibrium.
- Q4. Explain the role of costs and profitability in pricing decisions.

Section-C

- Q5. Explain the pareto criteria and its marginal conditions.
- Q6. Define and explain Arrow impossible theorem.

Section-D

- Q7. Explain existence and uniqueness of equilibrium.
- Q8. Define and explain partial and general equilibrium with examples.

Exam Code: 509603

Paper Code: 3253

Programme: Master of Science (Economics) Semester III

Course Title: Macroeconomic Theory-II

Course Code: MECL-3172

Time: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting atleast one from each section. The fifth question can be attempted from any section. Each question carries 14 marks.

SECTION – A

1. Explain the working of the IS–LM Model in a closed economy.
2. Explain the relative effectiveness of fiscal and monetary policies under the IS–LM model. Illustrate your answer with suitable diagrams.

SECTION – B

3. Examine the Structuralists' theory of inflation. How does it differ from the Monetarist approach?
4. Discuss Adaptive and Rational Expectations in the context of the Phillips curve. What are the policy implications of the Natural Rate Hypothesis?

SECTION – C

5. Describe the lags in the investment function and their implications for macroeconomic stability.
6. Discuss the Kaldor model of trade cycles. How it provides an explanation of cyclical fluctuations?

SECTION – D

7. Explain in detail the transmission mechanism of monetary policy in an economy.
8. Discuss the main features of New Classical Economics. Explain the real business cycle theory.

Exam Code: 509603

Paper Code: 3254

Programme: Master of Science (Economics) Semester III

Course Title: Economics of Development

Course Code: MECL-3173

Time: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting atleast one from each section. The fifth question can be attempted from any section. Each question carries 14 marks.

Section-A

1. What are the Inadequacies in Income-based Measures of development? Explain the construction of HDI.
2. Briefly explain Kuznets's Hypothesis of income distribution.

Section-B

3. Critically explain Todaro's Model of rural-urban migration.
4. Explain the various stages of economic development as given by Rostow.

Section-C

5. Explain the Balanced Growth Doctrine of economic development given by Prof. Nurkse.
6. Discuss the agricultural strategy for economic development.

Section-D

7. Briefly analyze the foreign aid to India. Give its impact on the Indian economy.
8. What do you understand by export promotion? Give arguments for and against export promotion strategy of growth in the context of an underdeveloped economy.

Exam Code: 509603

Paper Code: 3255 - R

Programme: Master of Science (Economics) Semester – III

Course Title: Theory of Statistics

Course Code: MECL-3174 ✓

Time Allowed: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

Section-A

1. a) Explain the properties of Axiomatic Probability.
b) Discuss the addition theorem of probability.
2. a) A bag contains 5 white and 3 red balls. Two balls are drawn at random. What is the probability that
i) both are red balls ii) one is white and the other is red
b) A factory has two machines, machine I produces 30 % of the output and machine II produces 70% of the output. Further, 5% of the items produced by machine I were defective and only 1% produced by machine II were defective. If a defective item is drawn at random, what is the probability that it was produced by machine I?

Section-B

3. a) Explain Chebyshev's inequality.
b) Discuss the properties of the moment generating function
4. Evaluate the properties of the Normal distribution

Section-C

5. Discuss the properties of maximum likelihood estimators
6. Derive the properties of the t-distribution

Section-D

7. a) Seven girls are chosen at random from a school and their heights are found to be in inches: 59, 60, 63, 65, 64, 61, 58
Test whether the mean height of girls of the school is 62 inches
b) The theory predicts that the proportion of beans in the four groups A, B, C and D should be in the ratio of 9:3:3:1. In an experiment among 1600 beans, the number in the four groups were 882, 313, 287 and 118. Does the experiment support the theory?
8. To test the significance of the variation of the retail prices of a commodity in three principal cities: Bombay, Kolkata and Delhi. Four shops were chosen at random in each city and prices observed were as follows

Bombay	16	8	12	14
Kolkata	14	10	10	6
Delhi	4	10	8	8

Do the data indicate that the prices in the three cities differ significantly?

Exam Code: 509603

Paper Code: 3255

Programme: Master of Science (Economics) Semester – III

Course Title: Theory of Statistics

Course Code: MECL-3174

Time Allowed: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one from each section. The fifth question may be attempted from any section. Each question carries 14 marks.

Section - A

1. a) Explain the properties of Axiomatic Probability.
b) Discuss the multiplication theorem of probability.
2. a) A person can hit the target in 3 out of 4 shots and B can hit the target in 2 out of 3 shots. What is the probability that the target will be hit?
b) There are two identical boxes containing 4 white and 3 red balls, white and 7 red balls, respectively. A box is chosen at random and a ball is drawn from it. If the ball drawn is white, what is the probability that it is from the first box?

Section - B

3. a) Explain the properties of the moment generating function.
b) Derive the properties of the Binomial distribution.
4. Derive the properties of the Gamma Distribution.

Section - C

5. Derive the properties of maximum likelihood estimators.
6. Derive the properties of the chi-square distribution.

Section - D

7. a) An intelligence test of two groups of boys and girls gave the following results

	Mean	Standard deviation	Number
Girls	62	3	80
Boys	60	4	100

Is there a significant difference in the mean score obtained by boys and girls?

b) A research investigator selected a random sample of 200 voters to find which political party they would vote for in the municipal elections. The results were obtained as follows

Political party	A	B	C	D
No. of Voters	40	90	50	20

8. a) A coin is tossed 10000 times and heads turn up 5195 times. Would you consider that coin to be unbiased?

b) Six girls are chosen at random from a school and their weights are found to be in kgs. as follows:

48, 55, 50, 53, 49, 52

Test whether the mean weight of girls in the school is 51 kgs.

Exam Code: 509603

Paper Code: 3256

Programme: Master of Science (Economics) Semester – III

Course Title: Data Science for Economists

Course Code: MECM-3175 (Opt-IX)

Time Allowed: 3 Hours

Max. Marks: 40

Note: Attempt five questions in all, selecting at least one from each section. The fifth question may be attempted from any section. Each question carries 8 marks.

Section – A

Q1. Define data analysis and discuss its importance in economic research. Explain how primary and secondary data differ in terms of collection methods and usage.

Q2. Discuss the principles of data visualization. Explain how line charts and pie charts enhance understanding and interpretation of economic data.

Section – B

Q3. What is data communication? Explain the main components and transmission modes used in modern data communication systems.

Q4. Discuss the role of the Internet in data communication and information sharing. Describe common online security threats and explain mechanisms used to safeguard data integrity.

Section – C

Q5. What do you understand by Big Data Analytics? Explain how structured and unstructured data are used in business and economic analysis.

Q6. Describe the significance of Big Data technologies in different sectors. Explain with example how Big Data is transforming healthcare industry.

SECTION – D

Q7. Define Cloud Computing. Discuss its key features, advantages, and limitations.

Q8. Explain the main components of Cloud Computing architecture. Discuss its various service models.

Exam Code: 224601

Paper Code: 1298

Programme: Master of Science (Fashion Designing and
Merchandising)

Semester – I

Course Title: History of Indian Costumes

Course Code: MFDL-1231 ✓

Examination Time: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

Section – A

1. Discuss the origin of clothing and explain the various theories associated with it.
2. Explain the development of costumes in relation to social and cultural factors.

Section – B

3. Describe the costumes of the Mauryan and Sunga period.
4. Explain the main costume characteristics of the British period with examples.

Section – C

5. Discuss the traditional costumes and Ornaments of the Jammu and Kashmir.
6. Describe the traditional costumes of the Maharashtra.

Section – D

7. Explain the dance costumes of Gujarat with Illustrations.
8. Write detailed notes on Kuchipudi dance costumes, mentioning their special features.

**Exam Code: 224601
(30)**

Paper Code: 1299

**Programme: Master of Science (Fashion Designing and
Merchandising)
Semester-I**

Course Title: Communication Skills in English

Course Code: MFDM-1232 ✓

Time Allowed: 3 Hours

Max Marks: 50

Note: Attempt five questions in all, choosing one question from each section and the fifth question from any section. All questions carry equal marks (5x10=50)

Section- I

1. What are the essentials of effective communication?
2. What do you know about the basic forms of communication?

Section- II

3. Discuss in detail reading tactics.
4. What are the different purposes of reading.

Section- III

5. Write a sales letter to a customer asking him to take subscription of Health magazine.
6. You are a wholesale paper merchant. Your payment has been delayed. Write a letter to the shopkeeper to release your payment.

Section- IV

7. Write an article on sustainable fashion.
8. Write an article on the challenges of fashion Industry.

Exam Code: 224603

Paper Code: 3272

Programme: Master of Science (Fashion Designing and
Merchandising) Semester III

Course Title: Global Costumes

Course Code: MFDL-3231 ✓

Time Allowed: 3 Hrs.

Total Marks: 70

Note: Attempt Five questions in all, selecting one question from each section. Fifth question can be attempted from any section. Each question carries 14 marks.

Section A

1. What do you know about the Garments, footwear, and headdresses worn by people of Babylonian period?
2. Discuss the following:-
 - a) Costume of citizens of Persian Empire
 - b) Costume worn by Persian Kings and soldiers

Section B

3. Write in detail about civilization of Ancient Egyptian people and their costumes?
4. Explain the following:-
 - a) Ancient Greek Garments
 - b) Footwears and Hairstyles of Ancient Greek people

Section C

5. Which is the National Garment of Ancient Roman Empire? Discuss its types and its draping with the help of Diagram?
6. "Byzantine people considered themselves Roman." If Agree, explain with the help of examples?

Section D

7. What are the various trends and styles existed during 20th century fashion in Female costumes?
8. How French Revolution affected French society. Also discuss its influence on dressing of people?

Exam Code: 224603

Paper Code: 3273

Programme: Master of Science (Fashion Designing and
Merchandising) Semester III

Course Title: Research Methodology

Course Code: MFDL-3232

Time Allowed: 3 Hrs.

Total Marks: 70

Note: Attempt Five questions in all, selecting one question from each section. Fifth question can be attempted from Section A, B or C only. Each question carries 14 marks.

Section - A

1. Define research and its importance.
2. Explain the research process.

Section - B

3. Explain the following type of sampling:
 - Simple random sampling
 - Stratified sampling
 - Deliberate sampling
 - Cluster sampling
4. Explain various methods of data collection

Section - C

5. Describe coding and tabulation by giving suitable example of each.
6. Write a short note on Mean, t-test and Chi-square.

Section - D

7. Design the layout of research project with minimum 20 respondents. Give example.

Exam Code: 225701

Paper Code: 1219 - R

Programme: Master of Science (Mathematics) Semester-I

Course Title: Real Analysis

Course Code: MMSL - 1331 ✓

Time Allowed: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting atleast one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

Section – A

Q-1 (a) Prove that set of all rational numbers is countable.

(b) Define the Space R^3 and prove that it is a metric Space under the metric d defined as

$$[d(x, y)]^2 = \sum_{i=1}^3 (x_i - y_i)^2 \quad \forall x, y \in R^3$$

Q-2 (a) Find open and closed spheres in the plane R^2 . Also find the derived set of set of natural numbers and set of irrational numbers.

(b) Prove the generalized Heine Borel theorem. Also prove that Cantor's set is a perfect set.

Section – B

Q-3 (a) Prove that union of two closed sets is a closed set with respect to the condition that A and B are Separated sets. Also find out all the components of a discrete metric space.

(b) Prove that a metric Space is disconnected (X, d) iff there exist a non empty proper subset of X which is open as well as closed.

- Q-4 (a) Prove that $\text{diam}(\bar{E}) = \text{diam}(E)$. Also prove that the set C of complex numbers with usual metric space is complete metric space.
 (b) State and Prove Cantor's intersection theorem.

Section – C

- Q-5 (a) State and Prove Baire's Category theorem
 (b) State And Prove fixed point theorem. Also give illustrative example.
 Q- 6 (a) Define uniform continuity in a metric space and establish a relation between continuity and uniform continuity
 (b) if f is mapping from X to Y . Then f is continuous iff image of the closure of A is contained in closure of the image of A

Section – D

- Q-7 (a) State and prove W.M. Test for uniform Convergence of Series.
 (b) Prove that the series $\sum (-1)^n \frac{x^2+n}{n^2}$ converges uniformly in every bounded interval but does not converge absolutely for any value of x .
 Q-8 (a) State and Prove lemmas of Weierstrass Approximation theorem.
 (b) If $f_n(x) = \frac{x^2}{x^2 + (1-nx)^2}$, $0 \leq x \leq 1$, $n=1,2,3,\dots$, then prove that given sequence is uniformly bounded on $[0,1]$, no subsequence of $f_n(x)$ can converge uniformly on $[0,1]$ and the given sequence is not equicontinuous on $[0,1]$

Exam Code: 225701

Paper Code: 1219

Programme : Master of Science (Mathematics)

Semester - I

Course Title: Real Analysis

Course Code: MMSL - 1331

Time Allowed: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all selecting atleast one question from each section. Fifth question can be attempted from any section. Each question carries 14 marks.

Section - A

- Q-1** (a) Let $X=C[0,1]$ =set of all valued continuous functions defined on $[0,1]$. Consider a mapping $d: X \times X \rightarrow R$ defined by $d(f,g)= \sup \{|f(x) - g(x)|: x \in [0,1]\} \forall f, g \in X$. Then prove that d is metric on $C[0,1]$.
(b) Prove that set of integers is countable.
- Q-2** (a) Let (X, d) be a metric Space and $E \subset X$ be any set, $\bar{E}$ is closed set and it is the smallest closed set containing set E .
(b) Define K-cell and Prove that every k-cell is compact.

Section - B

- Q-3** (a) Prove that Union of any family of connected sets having non-empty intersection is a connected set and every component is a closed set.
(b) Prove that intervals and only intervals are connected subset of R .

- Q-4 (a) Prove that a metric space is compact iff any sequence in X has a convergent subsequence.
 (b) State and Prove Cantor's Intersection Theorem.

Section – C

- Q-5 (a) Prove that every Complete Metric Space cannot be expressed as union of a sequence of nowhere dense sets.
 (b) Define fixed point of a mapping .Prove that every contraction mapping is continuous. What are convergent sequences in a discrete metric space?
- Q-6 (a) Prove that continuous image of a compact metric space is compact. Also give an example to show that Continuous image of open set need not open.
 (b) Prove that monotone functions have no discontinuities of second kind. Also state intermediate value theorem.

Section – D

- Q-7 (a) State and Prove theorem on Term by Term Integration of uniform convergence of the series.
 (b) Prove that the series converges $\sum \frac{\sin nx}{n}$ uniformly w.r.t x in $[\alpha, 2\pi - \alpha]$ where $0 < \alpha < \pi$.
- Q-8 (a) State and Prove W. M test for uniform convergence of the series.
 (b) Test the convergence of the series

$$\sum_{n=1}^{\infty} \left\{ \frac{2n^2x^2}{e^{(nx)^2}} - \frac{2(n-1)^2x^2}{e^{(n-1)x^2}} \right\}$$

Exam Code: 225701
(20)

Paper Code: 1220

Programme: Master of Science (Mathematics)
Semester-I

Course Title: Complex Analysis

Course Code: MMSL-1332

Time Allowed: 3 Hours

Max Marks: 70

Note:- Attempt five questions, selecting at least one question from each section. The Fifth question may be attempted from any section. Each question carries 14 marks.

Section-A

1. (a) Examine the nature of the function prove that

$f(z) = \frac{x^2 y^5 (x+iy)}{x^4 + y^{10}}$, $z \neq 0$, $f(0)=0$ in the region including the origin. 7

(b) Show that $u = \frac{1}{2} \log (x^2 + y^2)$ is harmonic and find its harmonic conjugate. 7

2. (a) Using Cauchy's Integral formula, Calculate

$\int_C \frac{1}{z(z+\pi i)} dz$, Where C the circle $|z + 3i| = 1$. 7

(b) If $u - v = (x - y)(x^2 + 4xy + y^2)$ and $f(z) = u + iv$ is analytic function of $z = x + iy$, find $f(z)$ in terms of z . 7

Section-B

3. (a) Use the transformation $w = \frac{1}{z}$, find the image of $|z - 2i| = 2$. 7
- (b) Evaluate $\int_C \frac{1}{z} dz$, where C denotes the square described in the positive sense with sides parallel to the axis and of length $2a$ and having its centre at the origin. 7
4. (a) Find the Mobius transformation which maps $1, -i, 2$ onto $0, 2, -i$, respectively. 7
- (b) Find a bilinear transformation which maps the $|z| = 1$, $i, -1$ respectively onto $w = i, 0, -i$ and $w = 1$, for this transformation, find the images of respectively into $z = \frac{1}{2}, z = 0$. 7

Section-C

5. State Taylor's theorem and Laurent's theorem and obtain the Taylor's and Laurent's series which represent the function $f(z) = \frac{z^2-1}{(z+3)(z+2)}$, When

(i) $|z| < 2$ (ii) $2 < |z| < 3$ (iii) $|z| > 3$

14

6. (a) Find the residue of $f(z) = \frac{z^3}{(z-1)(z-2)(z-3)}$, at $z = 1, 2, 3$ and ∞ . And show that the sum of these residues is zero.

7

- (b) Prove that all the roots of $z^7 - 5z^3 + 12 = 0$ lie between the circle $|z|=1$ and $|z|=2$.

7

Section-D

7. (a) Show that $z = a$ is an isolated essential singularity of

the function $\frac{e^{\frac{c}{z-a}}}{e^{\frac{c}{z-1}}}$.

7

(b) Evaluate $\int_0^{2\pi} \frac{d\theta}{(a+b\cos\theta)^2}$, where $a > 0, b > 0, a > b$.

7

8. (a) Show that $\int_0^\pi \frac{1+2\cos\theta}{(5+4\cos\theta)} d\theta = 0$.

7

(b) Show by Contour integration that $\int_0^\infty \frac{\sin x}{x} dx = \frac{\pi}{2}$.

7

Exam Code: 225701
(20)

Paper Code: 1221

Programme: Master of Science (Mathematics)
Semester-I

Course Title: Algebra-I

Course Code: MMSL-1333 ✓

Time Allowed: 3 Hours

Max Marks: 70

There are total Eight questions of equal marks (14 marks each), two in each of the four Sections (A-D). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Section A

1. (a) Prove that union of two subgroups of a group is a subgroup iff one is contained in the other. 7
(b) State and prove Lagrange's theorem for finite groups. Is its converse true. 7
2. (a) Prove that every subgroup of a cyclic group is cyclic. 7
(b) Show that every subgroup of an abelian group is normal. 7

Section B

3. (a) For a finite group G , prove that $|G| = \sum \frac{|G|}{|N(a)|}$ where the sum runs over one element a of each conjugate class. 7
- (b) State and prove Cayley's Theorem. 7
4. (a) Prove that A_4 has no subgroup of order 6. 7
- (b) Prove that the group of automorphisms of a cyclic group is abelian. 7

Section C

5. (a) State and prove Sylow's First theorem. 7
- (b) Every finite group has atleast one composition series. 7
6. (a) State and prove Jordan Holder theorem. 7
- (b) Show that every group of order 15 is cyclic. 7

Section D

7. (a) Define internal direct products. 7
- (b) Show that the group Z_8 cannot be written as the direct sum of two non-trivial subgroups. 7
8. (a) Show that the direct product of two cyclic groups G and G' is a cyclic group iff $(|G|, |G'|) = 1$ 7
- (b) Prove that Klein's four group is the direct product of its subgroups. 7

Exam Code: 225701

Paper Code: 1222

Programme: Master of Science (Mathematics)

Semester – I

Course Title: Mechanics-I

Course Code: MMSL-1334

Time Allowed: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting atleast one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

Section-A

Q1 (a) Show that two equal and opposite rotations of a rigid body about distinct axes are equivalent to a translation of the body. (5)

(b) A cyclist rides along a straight road with uniform speed V . At a given instant, the cyclist is at a point O on the road and the dog is at A , a point distant ' a ' from the road and such that OA is perpendicular to the road. The dog runs with speed V towards the cyclist. Taking OA and the road as axes of x and y respectively and coordinates of the dog as (x, y) .

Show that $\left[x^2 \left(\frac{d^2 y}{dx^2} \right)^2 \right] = \left[1 + \left(\frac{dy}{dx} \right)^2 \right]$ and hence prove that the equation of dog's path is $y = \frac{1}{2} \left\{ \left(\frac{x^2}{2a} \right) - a \log \left(\frac{x}{a} \right) - \frac{1}{2} a \right\}$. (9)

Q2 (a) Write a short note on hodograph. (5)

(b) A point P moves so that it always has a velocity compounded of V_1 parallel to a fixed line and V_2 in the transverse direction perpendicular to OP , where O is a fixed point. Prove that the orbit is a conic having O as a focus and discuss the cases when $V_1 > V_2$, $V_1 < V_2$, $V_1 = V_2$. (9)

Section-B

Q3 (a) A particle of mass m oscillates in a line with natural period $\frac{2\pi}{n}$. If an applied periodic force $F \cos pt$ now acts in the line so that the particle is instantaneously at rest at zero time at a distance d from the center of oscillation, prove that the displacement of the particle at a subsequent time t is

$$d \cos nt + \frac{F(\cos pt - \cos nt)}{(n^2 - p^2)m} \quad (7)$$

(b) Discuss in detail simple harmonic motion. (7)

Q4 Discuss the motion of a particle in a cycloid. (14)

Section-C

Q5 (a) Derive the differential equation of the orbit moving under a central force P per unit mass. (7)

(b) A particle is describing an ellipse of eccentricity e about a centre of force at a focus. Prove with usual notations

$V^2 = \mu[2/r - 1/a]$, $h^2 = \mu a(1 - e^2)$ When the particle is at one end of a minor axis its velocity is doubled. Prove that the new path is a hyperbola of eccentricity $(9 - 8e^2)^{1/2}$. (7)

Q6 (a) A particle of mass m describes the curve $r = a / (1 + 2\cos^2 \theta)$ under a force to the origin O . If the speed of the particle at the farther apse is v , find the law of force. When passing A , one of the nearer apses, the particle receives an impulse mkv along the outward normal. Show that if $k < 2\sqrt{3}$ the particle continues to describe a closed curve about the origin, but if $k > 2\sqrt{3}$ the new orbit has one asymptote making an angle θ with OA given by $\cos(\alpha + 2\theta) + 2\cos\alpha = 0$ where $\tan\alpha = \frac{1}{2}k$ (11)

(b) A particle of mass m is moving in a plane under a force F which is always directed towards the fixed point O . Show that $r^2\dot{\theta} = 0$. (3)

Section-D

Q7 (a) Determine the moment of inertia of the distribution about the axis through O having direction cosines $[\lambda, \mu, \nu]$ in terms of these direction cosines and A, B, C, D, E, F . (9)

(b) Find the moment of inertia and product of inertia of an elliptic disc. (5)

Q8 (a) Define Principal Axes. Show that at each point of a body there are three principal axes mutually at right angles to each other such that the product of inertia about them taken two at a time is zero. (9)

(b) State and prove the theorem of perpendicular axes for moments of inertia. (5)

Exam Code: 225701

Paper Code: 1223

Programme: Master of Science (Mathematics) Semester-I

Course Title: Mathematical Programming-I

Course Code: MMSL-1335

Time Allowed: 3 Hours

Max Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

Section-A

1. a) Explain the terms unbounded solution, infeasible solution. 4

- b) Use two phase simplex method to maximize $z = 5x_1 + 3x_2$
subject to the constraints: $2x_1 + x_2 \leq 1$; $x_1 + 4x_2 \geq 6$
 $x_1, x_2 \geq 0$

10

2. a) Obtain the basic solutions to the following system of linear equation; $x_1 + 2x_2 + x_3 = 4$
 $2x_1 + x_2 + 5x_3 = 5$ 4

- b) Use simplex method to solve the following LPP
maximize $z = 4x_1 + 10x_2$ subject to the constraints:

$$2x_1 + x_2 \leq 50; 2x_1 + 5x_2 \leq 100; 2x_1 + 3x_2 \leq 90$$

$$x_1 \geq 0, x_2 \geq 0$$

10

Section-B

3. a) State and prove Complementary Slackness theorem. 4

b) Find the starting solution in the following transportation problem by Least Cost Method.

Also obtain the optimum solution by using the best starting solution

	D ₁	D ₂	D ₃	D ₄	Supply	
S ₁	3	7	6	4	5	
S ₂	2	4	3	2	2	
S ₃	4	3	8	5	3	
Demand	3	3	2	2		10

4. a) Formulate the dual of the following linear programming problem:

Maximize $z = 5x_1 + 3x_2$ subject to the constraints:

$$3x_1 + 5x_2 \leq 15; 5x_1 + 2x_2 \leq 10$$

$$x_1 \geq 0, x_2 \geq 0$$

4

b) If the matrix elements represent the unit transportation times, solve the following transportation problem:

From	To				Available
	D ₁	D ₂	D ₃	D ₄	
O ₁	10	0	20	11	15
O ₂	1	7	9	20	25
O ₃	12	14	16	18	5
Required	12	8	15	10	45

10

Section-C

5. a) The following is the cost matrix of assigning 4 clerks to 4 key punching jobs. Find the optimal assignment if clerk 1 cannot be assigned to job 1:

Clerk	Job			
	1	2	3	4
1	--	5	2	0
2	4	7	5	6
3	5	8	4	3
4	3	6	6	2

What is the minimum total cost?

10

- b) Consider payoff matrix with respect to Player A and Solve it optimally:

$$A \begin{matrix} & B \\ \begin{bmatrix} 6 & 9 \\ 8 & 4 \end{bmatrix} & \end{matrix} \quad 4$$

6. a) Give the mathematical formulation of an assignment problem. 4

- b) Solve the following 3 X 5 game using dominance property

$$\begin{matrix} & \text{Player B} \\ \text{Player A} & \begin{bmatrix} 2 & 5 & 10 & 7 & 2 \\ 3 & 3 & 6 & 6 & 4 \\ 4 & 4 & 8 & 12 & 1 \end{bmatrix} \end{matrix} \quad 10$$

Section-D

7. a) Find the optimum integer solution to the following linear programming problem. Maximize $Z = 5x_1 + 8x_2$ Subject to

$$x_1 + 2x_2 \leq 8; 4x_1 + x_2 \leq 10$$

10

$$x_1 \geq 0, x_2 \geq 0 \text{ and integers}$$

- b) Explain the disadvantages of dynamic programming.

4

8. a) What are the applications of integer programming problem?

4

- b) Solve the following LPP using dynamic programming technique:

Maximize $Z = 10x_1 + 30x_2$ Subject to

$$3x_1 + 6x_2 \leq 168; 12x_2 \leq 240$$

10

$$x_1 \text{ and } x_2 \geq 0$$

Exam Code: 225703
(20)

Paper Code: 3213

Programme: Master of Science (Mathematics)
Semester-III

Course Title: Functional Analysis

Course Code: MMSL-3331

Time Allowed: 3 Hours

Max Marks: 70

Note: Attempt five questions in total by selecting at least one question from each section A-D. The fifth question may be selected from any Section. Each question carries 14 marks.

Section-A

1. a) Prove that the space l_p^n is a Banach space.

7

b) State and prove Holder's inequality.

7

2. a) Prove that all norms on a finite dimensional norm linear space are equivalent.

7

b) Let N and M be normed linear space over the same field of scalars and T is a linear transformation from N to M . Then T is bounded iff T takes bounded sets in N to bounded sets in M . 7

Section-B

3. a) Prove that a finite dimensional norm linear space is complete. 7

b) If x and y are different elements of a norm linear space N then there exists f in N^* Such that $f(x) \neq f(y)$ 7

4. a) Show that there exists natural imbedding of N into N^{**} . Where N is a norm linear space. 7

b) If M is a closed linear subspace of a norm linear space N and x_0 is a vector not in M . Then there exists a functional f_0 in N^* s.t. $f_0(M)=0$ but $f_0(x_0) \neq 0$. 7

Section-C

5. State and prove closed graph theorem.

14

6. Let T be an operator on a norm linear space N , prove that its conjugate T^* is an operator on N^* and $\phi : \beta(N) \rightarrow \beta(N^*)$ defined by $\phi(T) = T^*$ is an isometric isomorphism of $\beta(N)$ into $\beta(N^*)$, Which reverses product and preserves identity.

14

Section-D

7. a) State and prove projection theorem.

9

- b) State and prove Bessel's inequality for finite orthonormal sets.

5

8. a) State and prove Riesz-Representation theorem for continuous linear functional on Hilbert space.

9

b) If M is a linear subspace of Hilbert space, show that

M is closed iff $M = M^{\perp\perp}$.

5

Exam Code: 225703

Paper Code: 3214

Programme: Master of Science (Mathematics)

Semester – III

Course Title: Partial Differential Equations and Integral Equations

Course Code: MMSL-3332

Time Allowed: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

Section A

- 1 (a) Find the general solution of the differential equation

$$x^2 \frac{\partial z}{\partial x} + y^2 \frac{\partial z}{\partial y} = (x + y)z. \quad 7$$

- (b) Find the surface which intersects the surfaces of the system $z(x + y) = c(3z + 1)$ orthogonally and which passes through the circle $x^2 + y^2 = 1, z = 1$. 7

- 2 (a) Find the complete integral of the equations

$$p + q = pq. \quad 7$$

- (b) Solve by Jacobi's method $z^2 = pqxy$. 7

Section B

3. (a) Find the surface satisfying $t = 6x^3y$ and containing the two lines $y = 0 = z, y = 1 = z$. 7

- (b) Solve by Monge's Method $r = a^2t$. 7

4. (a) Solve by the method of separation of variables

$$\frac{\partial^2 z}{\partial x^2} - \frac{2\partial z}{\partial x} + \frac{\partial z}{\partial y} = 0. \quad 7$$

- (b) Obtain the general solution of the one-dimensional wave equation $\frac{\partial^2 u}{\partial x^2} = \frac{1}{c^2} \frac{\partial^2 u}{\partial t^2}$. 7

Section C

- 5 (a) Show that function $F(x) = (1 + x^2)^{-\frac{3}{2}}$ is a solution of the Volterra integral equation

$$F(x) = \frac{1}{1+x^2} - \int_0^x \frac{\eta}{1+x^2} F(\eta) d\eta. \quad 7$$

- (b) Solve the following linear integral equations:

$$F(x) = x + \int_0^x (\eta - x) F(\eta) d\eta. \quad 7$$

- 6 (a) Solve the Volterra's integral equation of second kind, by using method of successive approximation:

$$F(x) = 1 + \int_0^x F(\eta) d\eta, \text{ with } F_0(x) = 0. \quad 7$$

- (b) Solve by method of resolvent Kernel

$$F(x) = 1 + \lambda \int_0^1 (1 - 3x\eta) F(\eta) d\eta. \quad 7$$

Section D

- 7(a) Find the iterated Kernels for the following Kernel

$$K(x, \eta) = e^x \cos \eta; a = 0, b = \pi. \quad 7$$

- (b) Solve the integral equation

$$F(x) = 1 + \lambda \int_0^1 (1 - 3x\eta) F(\eta) d\eta$$

For what values of λ the solution does not exist. 7

- 8 (a) Using Fredholm determinants, find the resolvent kernel of the following Kernels:

$$K(x, \eta) = xe^\eta; a = 0, b = 1. \quad 7$$

- (b) Show that the integral equation

$$g(s) = f(s) + \frac{1}{\pi} \int_0^{2\pi} \sin(s+t) g(t) dt \text{ possesses infinite number of solution when } f(s) = 1. \quad 7$$

Exam Code: 225703

Paper Code: 3215

Programme: Master of Science (Mathematics)

Semester – III

Course Title: Operational Research-I

Course Code: MMSL-3333

Time Allowed: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks. *Only Non-Programmable and Non-Storage Type Calculators are allowed.*

Section-A

1. Solve by using Big-M method the following linear programming problem:

$$\begin{aligned} \text{Max } z &= -2x_1 - x_2, \text{ subject to } 3x_1 + x_2 = 3, \\ 4x_1 + 3x_2 &\geq 6, \quad x_1 + 2x_2 \leq 4 \quad \text{and } x_1 \geq 0, x_2 \geq 0 \end{aligned}$$

2. Use Two-Phase simplex method to solve the problem :

$$\begin{aligned} \text{Minimize } z &= x_1 - 2x_2 - 3x_3 \\ \text{subject to the constraints } &-2x_1 + x_2 + 3x_3 = 2, \\ &2x_1 + 3x_2 + 4x_3 = 1 \\ \text{and } &x_1 \geq 0, x_2 \geq 0, x_3 \geq 0 \end{aligned}$$

Section-B

3. State and Prove Complementary Slackness Theorem.
4. Use Branch-and-Bond technique to solve the following integer programming problem:

$$\begin{aligned} \text{Max } z &= 7x_1 + 9x_2, \\ \text{subject to } &-x_1 + 3x_2 \leq 6, \quad 7x_1 + x_2 \leq 35, \\ &0 \leq x_1, x_2 \leq 7 \text{ and } x_1, x_2 \text{ are integers} \end{aligned}$$

Section-C

5. Determine an initial basic feasible solution using
- Vogel's method
 - North-West corner method by considering the following transportation problem

		A_1	B_1	C_1	D_1	E_1	Supply
Origin	A	2	11	10	3	7	4
	B	1	4	7	2	1	8
	C	3	9	4	8	12	9
Demand		3	3	4	5	6	21

6. Solve the travelling-salesman problem given by the following data

$$C_{12} = 20, \quad C_{13} = 4, \quad C_{14} = 10,$$

$$C_{23} = 5, \quad C_{34} = 6$$

$$C_{25} = 10, \quad C_{35} = 6, \quad C_{45} = 20,$$

where $C_{ij} = C_{ji}$ and there is no route between cities I and j if the value of C_{ij} is not shown.

Section-D

7. Solve the following (2 X 4) game:

A	B				
	I	I	II	III	IV
		2	2	3	-1
		II	4	3	2

8. Solve the following Linear Programming problem by dynamic programming approach.

Maximize $z = 2x_1 + 5x_2$, subject to constraints

$$2x_1 + x_2 \leq 43, \quad 2x_2 \leq 46 \text{ and } x_1 \geq 0, x_2 \geq 0$$

Exam Code: 225703
(20)

Paper Code: 3216

Programme: Master of Science (Mathematics)
Semester-III

Course Title: Statistics-I

Course Code: MMSL- 3334

Time Allowed: 3 Hours

Max Marks: 70

Note: Candidates are required to attempt five question selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 14 marks. The students can use only non-Programmable & Non-Storage Type Calculator.

Section-A

1. (a) What are the criteria of a good measure of central tendency? Also, Prove that the sum of the squared deviation is least when taken from the mean.
(b) What do you mean by skewness and kurtosis of a distribution? Describe briefly their measures.
2. (a) Give various approaches to define probability. Write limitations of each, if any.

b) Let X has the probability density function

$$f(x) = \begin{cases} c + x & ; \quad -2 < x \leq 0 \\ c - x & ; \quad 0 < x \leq 2 \\ 0 & ; \quad \text{otherwise} \end{cases}$$

Determine the constant c , cumulative density function

$F(x)$ and find $P\left(-\frac{1}{3} < x \leq \frac{4}{3}\right)$.

Section-B

3. a) A man with n keys wants to open his door and tries the keys independently and at random. Find the mean and variance of number of trials required to open the door, if unsuccessful keys are

(i) Not eliminated from further selection and

(ii) Eliminated from further selection.

b) Let X be a non-negative random variable with distribution function F , show that:

$$E(X) = \int_0^{\infty} [1 - F(x)] dx - \int_{-\infty}^0 F(X) dx$$

4. a) Let (X, Y) be two-dimensional non-negative continuous random variables having the joint density function:

$$f(x, y) = \begin{cases} 4xy e^{-(x^2+y^2)} & ; x \geq 0, y \geq 0 \\ 0 & ; \text{otherwise} \end{cases}$$

Find the density functions of $U = \sqrt{X^2 + Y^2}$

- b) Discuss the properties of moment generating function along with their limitations.

Section-C

5. a) State Chebyshev's Inequality and show that it leads to the weak law of large numbers.
- b) If $X \sim B(n, p)$, obtain the recurrence relation for its central moments and hence obtain values of β_1 and β_2
6. a) Define geometric distribution of a random variable. Obtain its mean and variance. Also prove the lack of memory property of it.
- b) A manufacturer, who produces medicine bottles, finds that 0.1% of bottles are defective. The bottles are packed in boxes containing 500 bottles. A drug manufacturer buys 100 boxes from the producer of

bottles. Using Poisson distribution, find how many boxes will contain

- (i) no defective, and
- (ii) at least two defectives.

Section-D

7. a) What is normal distribution? Describe its important properties.
b) If X and Y are independent Gamma variate with parameters μ and ν respectively, then show that $Z = X + Y$ is also distributed as gamma with parameter $(\mu + \nu)$.
8. a) What is association of attributes? Write a note on the strength of association and how it is measured.
b) Obtain the equation of two lines of regression for the following data. Also obtain the estimate of X for $Y=70$

X	65	66	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

Exam Code: 225501

Paper Code: 1209

Programme: Master of Science (Physics) Semester - I

Course Title: Analog and Digital Electronics

Course Code: MPHL-1391 ✓

Time Allowed: 3 Hours

Max. Marks: 70

Note: - Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

Section A

1. (a) Explain the working of MOSFET and its characteristics. (7)
(b) How SCR is modified using four layer device and discuss its application. (7)
2. (a) How storage devices work and discuss different types of memories. (7)
(b) Discuss the Construction and working of U.J.T and its use. (7)

Section B

3. (a) What are operational Amplifiers and its characteristics? Discuss its input/output impedance? (7)
(b) Write a note on Schmitt trigger and Logarithmic amplifiers. (7)
4. Explain the following:
 - (a) Electronic Analog computational circuit
 - (b) Integrator
 - (c) Differentiator
 - (d) Summer in context of Operational Amplifiers(4 X 3.5 = 14)

Section C

5. (i) Convert the following:

(a) $(829)_{10}$ to Hexadecimal

(b) $(778.7625)_{10}$ to hexadecimal

(c) $(11011101100)_2$ to hexadecimal

(7)

(ii) Explain the working of

(a) Encoders/ Decoders

(b) Parity generators and Adder Subtractor circuits

(3.5 + 3.5)

6. (a) Explain the concept of:

(i) Karnaugh maps with rules and three variable example

(ii) Multiplexer and De Multiplexer

(7)

(b) Prove that

(i) $A + \bar{A}B = A + B$

(ii) $(A+B)(A+C) = A+BC$.

Also state De. Morgan's theorem

(7)

Section D

7. Explain the concept of

(i) J-K Flip Flop

(ii) Binary Ladder and , Analog to Digital Converter

(14)

8. Write a note on the following:

(a) Registers

(b) Up-Down Counters

(c) Digital to Analog Converter

(14)

Exam Code: 225501

Paper Code: 1210

Programme: Master of Science (Physics) Semester - I

Course Title: Mathematical Physics

Course Code: MPHL-1392 ✓

Time Allowed: 3 Hours

Maximum Marks: 70

Note: - Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks.

Section-A

1. (a) Obtain the Fourier Series expansion for

$$F(x) = \begin{cases} -\pi & -\pi < x < 0 \\ x & 0 < x < \pi \end{cases}$$

Also Show that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}$ (7)

- (b) Find Fourier series of function $F(x) = x \sin x$; $-\pi < x < \pi$. (7)

2. Define Tensors. Discuss the Algebraic operations on tensors. (14)

Section-B

3. (a) Evaluate $\int_0^{2\pi} \frac{\cos 2\theta}{5 + 4 \cos \theta} d\theta$ by using contour integration. (7)

- (b) State and Prove Cauchy Integral Formula. (7)

4. (a) State & Prove Laurent's Theorem. (7)

- (b) Find the Laurent Series expansion of (7)

$$f(z) = \frac{z}{(z-1)(z-2)} \quad \text{valid for } |z-1| > 1$$

Section-C

5. (a) Prove that $P_n(x)$ is the coefficient of Z^n in the expansion of $(1-2xz+z^2)^{-1/2}$ in ascending powers of x . (7)

(b) Show that

$$\int_{-1}^{+1} [P_n(x)]^2 dx = \frac{2}{2n+1} \quad (7)$$

6. (a) Find the power series solution (frobenious method) of differential equation about $x=0$

$$3x \frac{d^2 y}{dx^2} + 2 \frac{dy}{dx} + y = 0 \quad (7)$$

(b) Prove that

$$J_{1/2} = \sqrt{\left(\frac{2}{\pi x}\right)} \sin x \quad (7)$$

Section-D

7. (a) Prove that set of integers is a group under addition. (7)

(b) Define Abelian group. Show that $(1, -1, i, -i)$ is an abelian group under multiplication. (7)

8. (a) Define Isomorphic and Homomorphic groups. Differentiate between them and give at least two properties of each. (7)

(b) Write a note on (i) special unitary group $SU(2)$ (ii) Permutation group. (7)

Exam Code: 225501

Paper Code: 1211

Programme: Master of Science (Physics) Semester - I

Course Title: Classical Mechanics

Course Code: MPHL-1393

Time Allowed: 3 Hours

Maximum Marks: 70

Note: - Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks. Students can use non-scientific calculator if necessary.

Section A

1. (a) Explain why the rigid body possesses six degrees of freedom. (3)

(b) What is D'Alembert's principle? Derive Lagrange's equations of motion from it for conservative system. (11)

2. (a) Prove the laws of conservation of linear momentum, angular momentum and energy for a system of interacting particles. (9)

(b) The Lagrangian of a particle moving in a plane is given by Cartesian coordinates as $L = \dot{x}\dot{y} - x^2 - y^2$
Find the expression for its canonical momentum p_r (in radial coordinates r). (5)

Section B

3. State and prove Kepler's three laws of planetary motion. (14)

4. (a) A mass m , moves in a circular orbit of radius r_0 under the influence of a central force whose potential is $-\frac{k}{r^n}$. Show that the circular orbit is stable under small oscillations, if $n < 2$. (5)

(b) What is differential scattering cross-section? Prove its dependence on the scattering angle ϕ . (9)

Section C

5. (a) Derive transformation equations for the generating functions of types $F_1(q, Q, t)$, $F_2(q, P, t)$. (9)

(b) What are fundamental Poisson brackets? Deduce them. (5)

6. (a) What are canonical transformations? Give conditions for a transformation to be canonical. Write a short note on infinitesimal contact transformation. (9)

(b) A canonical transformation $(q, p) \rightarrow (Q, P)$ is made through the generating function $F(q, P) = q^2 P$ on the Hamiltonian $H(q, P) = \frac{p^2}{2\alpha q^2} + \frac{\beta}{4} q^4$ where α and β are constants. Find the equations of motion for (Q, P) . (5)

Section D

7. (a) Define inertia tensor. Give its physical significance. (5)

(b) What is a rigid body? Obtain Euler's equation of motion for a rigid b (9)

8. What is the theory of small oscillations? By using theory of small oscillations find expression for frequency of free vibrations. (14)

Exam Code: 225501

Paper Code: 1212

Programme: Master of Science (Physics) Semester - I

Course Title: Computational Techniques

Course Code: MPHL-1394 ✓

Time Allowed: 3 Hours

Maximum Marks: 70

Note: - Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks. Students can use Non-programmable scientific calculator or trigonometric/logarithmic table.

Section A

1. (a) Explain the importance of inline functions and function handlers? How they are defined and used? Give examples? (3.5)
- (b) What is p-code in MATLAB? Explain its importance? (3.5)
- (c) Explain Switch Case Otherwise and Break statements in MATLAB with proper examples? (7)
2. Discuss about cells and structures in MATLAB with examples in detail? (14)

Section B

3. (a) What is interpolation? How it is different from curve fitting? Derive Newton's Backward interpolation formula? When it is preferred? (9)
- (b) Estimate from the following table the no. of students who got the marks between 40 and 45? (5)

Marks :	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80
No. of Students :	31	42	51	35	31

4. (a) Prove that the divided differences are symmetrical in their arguments? (7)
- (b) Compute $f(8)$ for the following data. (7)

$x:$	4	5	7	10	11	13
$f(x):$	48	100	294	900	1210	2028

Section C

5. (a) A solid of revolution is formed about the x-axis, the area between the x-axis, the lines $x=0$ and $x=1$ and a curve through the points with the following co-ordinates: (7)

x	0.00	0.25	0.50	0.75	1.00
Y	1.0000	0.9896	0.9589	0.9089	0.8415

Estimate the volume of the solid formed by Simpson 1/3 rule.

(b) Derive Trapezoidal rule to solve numerical integration?

Explain it graphically? (7)

6. Using Runge-Kutta fourth order method, find approximate value of y correct up to three decimal places at $x=0.2, 0.4$ and 0.6 for

$$\frac{dy}{dx} = 1 + y^2$$

given that $y = 0$ when $x = 0$ (14)

Section D

7. Discuss the Gauss elimination method? Why it is preferred over Gauss Jordan Method? Solve the following system of linear equations by Gauss elimination method.

$$5x + y + z + w = 4$$

$$x + 7y + z + w = 12$$

$$x + y + 6z + w = -5$$

$$x + y + z + 4w = -6$$

(14)

8. Discuss False-position method with the help of graph? Find the root of $x^3 - 2x - 5 = 0$ in the interval $(1.75, 2.5)$ using False position method correct up to 3 decimal places. (14)

Exam Code: 225501

Paper Code: 1213

Programme: Master of Science (Physics) Semester I

Course Title: Introduction to Glass Science and Glass

Ceramics

Course Code: MPHM-1395

Time Allowed: 3 Hours

Max. Marks: 40

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any Section. Each question carries 8 marks.

Section A

1. Explain the classification of materials on basis of structure with suitable examples. 8
2. Write a note on Obsidian, Fulgurites and Lunar Glasses. 8

Section B

3. Explain the concept of glass formers, modifiers, and intermediates with examples. 8
4. Define and differentiate between homogeneous and heterogeneous nucleation. 8

Section C

5. A) How do glass ceramics differ from traditional glasses? 2
B) Discuss the effect of temperature on thermal expansion of glasses. 6
6. Describe the methods for determination of density of glasses. 8

Section D

7. Explain the role of the Indian glass industry in the global market. Mention major players and their contributions. 8
8. What are the prospects of recyclable or green glasses? 8

Exam Code: 225503

Paper Code: 3205

Programme: Master of Science (Physics) Semester III

Course Title: Quantum Mechanics-II

Course Code: MPHL-3391 ✓

Time Allowed: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question can be attempted from any section. Each question carries 14 marks. Use of Scientific Calculator is allowed.

Section-A

1. Consider the helium atom problem where the electron-electron interaction is treated as a perturbation. Using first-order perturbation theory, calculate the first-order correction to the energy of the ground state of the Helium atom due to the repulsive Coulomb interaction between the two electrons. Assume that the electrons are in the $1s$ orbital. (14)
2. A particle in a one-dimensional box of length L is subject to a perturbation $H' = \lambda x^2$. Using second-order perturbation theory, calculate the correction to the energy of the first excited state of the particle in the box. Assume that λ is small and show all the steps. (14)

Section-B

3. Use partial wave analysis to calculate the total cross-section for scattering by a potential $V(r)$ in the low-energy limit. Assume the phase shift is small and expand the cross-section to first order in the phase shift. (14)
4. Find the total scattering potential for the particles scattered from a Yukawa potential. What are the conditions for the validity of Born-approximation for the potential? (9, 5)

Section-C

5. Find the covariant form of Dirac's equation for a particle moving at a relativistic speed. Find the matrix elements for invariance of Dirac's equation under rotational motion. (4, 10)
6. Find the Klein Gordon equation for a particle in coulomb potential. (14)

Section-D

7. a. What is the relation between spin and statistics? How the quantum particles are classified according to the statistics? What are the differences between bosons and fermions? (3, 2, 6)
- b. Consider two non-identical bosons of mass m_1 and m_2 ($m_1 > m_2$) in a two-dimensional potential well.
- i. Write down the ground and first excited state wave function for the two-fermion system.
- ii. Calculate the ground and first excited state energy of the system. (3)
8. a. Write short notes on the following:
- I. Exchange degeneracy
 - II. Symmetrisation postulate
 - III. Symmetrizer and anti-symmetrizer operator (9)
- b. Prove that the wave function of two identical particles can be written as a sum of symmetric and anti-symmetric operator. (5)

Exam Code: 225503

Paper Code: 3206

Programme: Master of Science (Physics) Semester III

Course Title: Electrodynamics - II

Course Code: MPHL-3392

Time Allowed: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question can be attempted from any section. Each question carries 14 marks.

Section-A

1. a) Draw and compare the variation of fields near the surface of a perfect conductor and surface of a good but not perfect conductor. 4
- b) Comment on the statement that the resistive loss in a good conductor is inversely proportion to skin depth and conductivity. 10
2. Prove that phase velocity of a cylindrical waveguide is infinite at cut-off frequency. 14

Section - B

1. I. Prove the following statements:
 - a) Moving clock runs slow.
 - b) Moving objects have shorter lengths.
 - c) Event happening at same times in one frame may not be happening at same time in another. $3 \times 3 = 9$
- II. Write the four-vector notation of momentum. 5
4. Solve the Lorentz force in terms of relativistic electrodynamics. How does it relate to the invariance of Maxwell's equations? 14

Section - C

5. Explain the concept of dipole radiation. Why does a charge oscillating at a frequency Ω generate a field primarily at that frequency? 14

6. For a system with a quadrupole oscillating at angular frequency ω , derive the electric field. Calculate the time-averaged power radiated by the quadrupole. Explain how the radiation pattern for a quadrupole differs from that of a dipole. 14

Section - D

7. Using the retarded potential formulation, derive the electric and magnetic fields for a charge moving with uniform velocity. How do these fields differ from the static Coulomb field? 14
8. Derive the Abraham-Lorentz force (radiation reaction force) on an accelerating charge. Discuss its physical implications, especially in the context of self-interaction. 14

(For Reappear Candidates Only 2023-24))

Exam Code: 209003

Paper Code: 9351

Programme: Master of Science (Physics) Semester III

Course Title: Electrodynamics-II

Course Code: MPHL-3392

Time Allowed: 3 Hours

Max. Marks: 80

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question can be attempted from any section. Each question carries 16 marks.

Section-A

1. a) Draw and compare the variation of fields near the surface of a perfect conductor and surface of a good but not perfect conductor. 5
- b) Comment on the statement that the resistive loss in a good conductor is inversely proportional to skin depth and conductivity. 11
2. Prove that phase velocity of a cylindrical waveguide is infinite at cut-off frequency. 16

Section - B

3. I. Prove the following statements:
 - a) Moving clock runs slow.
 - b) Moving objects have shorter lengths.
 - c) Event happening at same times in one frame may not be happening at same time in another. $3 \times 3 = 9$
- II. Write the four-vector notation of momentum. 7
4. Solve the Lorentz force in terms of relativistic electrodynamics. How does it relate to the invariance of Maxwell's equations? 16

Section – C

5. Explain the concept of dipole radiation. Why does a charge oscillating at a frequency Ω generate a field primarily at that frequency? 16
6. For a system with a quadrupole oscillating at angular frequency ω , derive the electric field. Calculate the time-averaged power radiated by the quadrupole. Explain how the radiation pattern for a quadrupole differs from that of a dipole. 16

Section - D

7. Using the retarded potential formulation, derive the electric and magnetic fields for a charge moving with uniform velocity. How do these fields differ from the static Coulomb field? 16
8. Derive the Abraham-Lorentz force (radiation reaction force) on an accelerating charge. Discuss its physical implications, especially in the context of self-interaction. 16

Exam Code: 225503

Paper Code: 3207

Programme: Master of Science (Physics) Semester III

Course Title: Condensed Matter Physics - II

Course Code: MPHL-3393

Time Allowed: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question can be attempted from any section. Each question carries 14 marks.

Section-A

1. (a) Explain in detail regarding Langevin quantum theory of Paramagnetism (7)
- (b) Explain the concept of origin of permanent magnetic dipoles. (7)
2. (a) Write in detail about quenching of orbital angular momentum and adiabatic demagnetisation (7)
- (b) Explain in detail about paramagnetic susceptibility of conduction electrons. (7)

Section - B

3. (a) Explain in detail (i) Ferromagnetic domain theory (ii) Weiss theory of spontaneous magnetisation of Ferromagnetism (7)
- (b) Explain the concept of anisotropy energy of ferromagnetic solid. (7)
4. Explain each in detail (a) Bloch wall and its thickness (b) Quantization of Spin Waves (c) Two Sub Lattice Model (14)

Section - C

- 5 (i) Write a note on each (a) Type I and Type II Superconductors (b) critical magnetic field and Critical temperature (c) Meissner effect (7)
- (ii) Explain in detail the following (a) Flux Quantisation in a superconducting ring (b) a.c and d.c Josephson's effect (7)

6. (i) What is (a) B.C.S theory of Superconductors
(b) Thermodynamics of superconducting transition (7)
(ii) Derive London's equation for Superconductors (7)

Section - D

7. Explain the following in detail (a) Decay Mechanism
(b) Reflection and refraction (c) absorption and transmission (d) luminescence (14)
8. Explain the following (a) luminescence of thalium activated halides (b) sulphide phosphors (14)

Exam Code: 225503

Paper Code: 3208

Programme: Master of Science (Physics) Semester III

Course Title: Nuclear Physics

Course Code: MPHL-3394

Time Allowed: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question can be attempted from any section. Each question carries 14 marks. Use of Non-Scientific calculators or logarithmic tables is allowed.

Section - A

1. Discuss the partial wave analysis of neutron-proton scattering and find the expression for total scattering cross-section and hence find the scattering length. (14)
2. (a) Explain the meson theory of nuclear forces as proposed by Yukawa. Derive the expression for the potential between two nucleons due to meson exchange. (7)
- (b) Find the ground state wavefunction of deuteron and the depth of square well potential assuming the binding energy to be 2.2 MeV and deuteron radius as 2 fm. (7)

Section - B

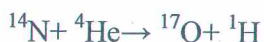
3. Derive the semi-empirical mass formula for nuclear binding energy. How this formula can be used to find the most stable isobar. (14)
4. What is role of spin orbit coupling in the development of shell model? Discuss how shell model successfully explain the angular momenta, parities and magnetic moments of various nuclei? Also find ground states angular momenta and parities of ${}^{13}\text{Al}^{27}$, ${}^{16}\text{S}^{33}$ and ${}^{18}\text{A}^{41}$. (14)

Section - C

5. Discuss how the introduction of the neutrino resolved the issue of energy conservation in beta decay. Include in your discussion the expression for the transition probability and how it accounts for the continuous beta spectrum observed experimentally. (14)
6. Discuss the selection rules for gamma decay transitions and find the relations for electric and magnetic transition probabilities in terms of electric and magnetic multipole moments. (14)

Section - D

7. (a) What do you mean by Q-value of a nuclear reaction? Find an expression of Q-value in terms of measurable quantities? (7)
- (b) Consider the nuclear reaction:



- Mass of ^{14}N = 14.003074 u, Mass of ^4He = 4.002603 u, Mass of ^{17}O = 16.999132 u, Mass of ^1H = 1.007825 u, Calculate the Q-value of the reaction. (1 atomic mass unit, or u, is approximately equal to 931.5 MeV in energy equivalent.) (7)
8. Derive expression for total reaction cross section by using partial wave analysis and also discuss the phenomenon of shadow scattering. (14)

Exam Code - 225001

Paper Code: 1230

Programme: Master of Science (Zoology) Semester- I

Course Title- Functional Organization of Animals - I

Course code - MZOL-1481 ✓

Time Allowed: 3 Hours

Max Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks. Draw neat and well labelled diagrams wherever required.

Section – A

- Q1. Explain filter feeding in detail. Support your answer with suitable examples 14
- Q2. Give regulation of digestive secretions in chordates. 14

Section – B

- Q3. Explain in detail different types of circulatory systems. 14
- Q4. Give evolution of heart in vertebrates. 14

Section – C

- Q5. Describe aquatic respiratory organs in invertebrates. 14
- Q6. Write a note on the following:
- a. Aerial respiratory organs
 - b. Respiratory pigments

2X7=14

Section – D

- Q7. Discuss in detail pattern of reproduction in non-chordates and their larval forms. 14
- Q8. Write detailed note on following
- (a) Malpighian tubules
 - (b) Green glands

2X7=14

Exam Code: 225001

Paper Code: 1231

Programme: Master of Science (Zoology) Semester- I

Course Title: Animal Ecology

Course Code: MZOL-1482 ✓

Time Allowed: 3 Hours

Max Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks. Draw neat and well labelled diagrams wherever required.

Section A

1. What do you mean by terrestrial biomes? Describe the characteristics along with distribution of animals and plants present in these biomes. 14
2. Discuss the role of light and Fire as an important Ecological factor by giving suitable examples. 14

Section B

3. What is ecological succession? Describe in detail. 14
4. What do you understand by Antagonism? Discuss its different types with suitable examples. 14

Section C

5. Give an account of structural features showing arboreal adaptations along with examples. 14
6. Write a note on following
 - a) Methods of sampling 7
 - b) Population growth curves 7

Section D

7. Give an account on sustainable development of ecosystems. 14
8. Describe following
 - a) Oriental Realm 7
 - b) Ethiopian Realm 7

Exam Code: 225001

Paper Code: 1232

Programme: Master of Science (Zoology) Semester – I

Course Title: Cell Biology

Course Code: MZOL-1483 ✓

Time Allowed: 3 Hours

Max Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. The fifth question may be attempted from any section. Each question carries 14 marks.

Section A

- Q1 a) Write in detail about the Actin and Myosin filament. 7
 b) Write a note on rRNA processing. 7
 Q2. a) Explain Singer and Nicholson model of Plasma membrane with well labelled Diagram. 10
 b) Write in brief about the Nuclear Pore complex. 4

Section B

- Q3. a) Explain the structure, its type and function of endoplasmic reticulum. 10
 b) Write a note on prokaryotic and Eukaryotic ribosomes. 4
 Q4. a) Write in brief about the Golgi-endoplasmic reticulum-lysosome network. 6
 b) Explain the mechanism of destruction of misfolding protein. 8

Section C

- Q5. Explain the structure and function of Mitochondria with well labelled diagram. 14
 Q6. a) Write a note on
 i) Lysosomal acid hydrolases ii) Lysosome formation. 5+5
 b) Write a note on Glyoxylate pathway. 4

Section D

- Q7. a) Explain the various check point in cell cycle. 7
 b) Explain the function of cell surface receptors. 7
 Q8. a) Explain the pathway of intracellular signal transduction. 7
 b) Explain the regulation of CDK-cyclin activity. 7

Exam Code: 225001

Paper Code: 1233

Programme: Master of Science (Zoology) Semester- I

Course Title: Concepts of Biotechnology

Course Code: MZOL-1484

Time Allowed: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 14 marks. Draw neat and well labelled diagrams wherever required.

Section – A

- Q1. Give any three protocols for cell viability. (14)
Q2. Give detailed account of embryonic stem cells. (14)

Section – B

- Q3. Write what you know about RAPD markers. (14)
Q4. Give detailed account of Sanger method of DNA sequencing. (14)

Section – C

- Q5. Write principle, theory and applications of DNA foot printing. (14)
Q6. Give stepwise procedure of Polyacrylamide Gel Electrophoresis. (14)

Section – D

- Q7. Define monoclonal antibodies? Discuss procedure for detection of monoclonal antibodies. (14)
Q8. Give applications of cytokines in detail. (14)

Exam Code: 225001

Paper Code: 1234

Program: Master of Science (Zoology) Semester – I

**Course Title: Computer Programming and Data
Processing**

Course Code: MZOM-1135

Time: 3Hours

Max. Marks: 40

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question may be attempted from any section. Each question carries 8 marks.

SECTION-A

1. What are hardware and software concepts? Explain the components of computer.
2. What is an Operating System? What are the functions of Operating System.

SECTION-B

3. What do you mean by Power Point? Explain the features of Power Point?
4. What are the various formatting options available in Ms-Excel? Explain.

SECTION-C

5. What is Identifier? How is user defined identifier different from a standard identifier?
6. What is an operator and explain the various types of operators in C?

SECTION-D

7. What are the various types of if statements available in C? Explain it.
8. Discuss the need of array. How the individual members of array are accessed?

Exam Code: 225003

Paper Code: 3223

Programme: Master of Science (Zoology) Semester III

Course Title: Research Techniques and Methodology

Course Code: MZOL-3481 ✓

Time Allowed: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question can be attempted from any section. Each question carries 14 marks.

Section-A

- Q1) (a) Discuss the various types of rotors used in Centrifugation. 7
 (b) What do you mean by Sedimentation coefficient? How it can be determined for subcellular fractions. 7
 Q2) Compare and contrast between Affinity Chromatography and Ion exchange Chromatography. 14

Section-B

- Q3) Give an account of the NMR Spectroscopy and its applications. 14
 Q4) Explain briefly-
 (a) Fluorescence Resonance Energy Transfer microscopy 7
 (b) Patch clamp 7

Section-C

- Q5) Explain the General principles and Support media for Electrophoresis. 14
 Q6) Write short notes on-
 (a) Capillary electrophoresis 7
 (b) Electrophoresis of Nucleic Acids 7

Section-D

- Q7) Explain in brief-
 (a) Solid and Liquid Scintillation 7
 (b) Geiger Muller tube 7
 Q8) Describe the various safety rules in the radio isotopic studies. 14

Exam Code: 225003

Paper Code: 3224

Programme: Master of Science (Zoology) Semester III

Course Title: Developmental Biology - I

Course Code: MZOL-3482

Time Allowed: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question can be attempted from any section. Each question carries 14 marks. Support your answers with suitable diagrams wherever necessary.

Section - A

- Q1. Describe the process of Oogenesis with the help of well labelled diagrams. 14
- Q2. Write detailed notes on
- a) Embryo Transplantation 7
 - b) Fast and slow block of polyspermy 7

Section - B

- Q3. Describe various types and patterns of cleavage and also discuss its characteristics. 14
- Q4. Explain the following with suitable diagrams & illustrations-
- a) Morphogenetic Movements 7
 - b) Diploid Parthenogenesis 7

Section - C

- Q5. Discuss the following-
- a) Compare and contrast autonomous and conditional specification, giving examples of organisms or cells that follow each pathway. 7
 - b) Explain syncytial specification and its unique aspects in organisms like *Drosophila*. 7
- Q6. Describe the determination of early embryonic induction. 14

Section - D

Q7. Describe post-translational regulation of gene expression and its importance in development. Explain how post-translational modifications affect protein activity, stability, and function, and provide examples of how these modifications contribute to developmental processes. 14

Q8. Describe how enhancers, silencers, and other regulatory elements control gene expression in specific cell types. 14

Exam Code: 225003

Paper Code: 3225

Programme: Master of Science (Zoology) Semester III

Course Title: General Biochemistry

Course Code: MZOL-3483

Time Allowed: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question can be attempted from any section. Each question carries 14 marks. Write legibly and draw well labelled diagram wherever necessary.

Section-A

- Q1) Discuss in detail the Michaelis-Menton kinetics for enzymatic activity. 14
- Q2) Explain in detail-
- (a) Energy mechanics of enzymatic reactions 7
- (b) Modifiers of Enzyme activity 7

Section-B

- Q3) (a) Explain the fates of Glycolysis. 7
- (b) Discuss the Mechanism of Gluconeogenesis. 7
- Q4) Describe the biochemistry and biological significance of Pentose phosphate pathway. 14

Section-C

- Q5) Write short notes on-
- (a) Regulation of citric acid cycle 7
- (b) Glyoxylate cycle 7
- Q6) Explain in detail the reactions of citric acid cycle. 14

Section-D

- Q7) Explain in brief-
- (a) Shuttle System in Mitochondria 7
- (b) Regulation of oxidative phosphorylation 7
- Q8) Discuss the mechanism and energy output of the β -Oxidation of fatty acids. 14

Exam Code: 225003

Paper Code: 3226

Programme: Master of Science (Zoology) Semester III

Course Title: Applied Zoology-II (Vertebrates)

Course Code: MZOL-3484

Time Allowed: 3 Hours

Max. Marks: 70

Note: Attempt five questions in all, selecting at least one question from each section. Fifth question can be attempted from any section. Each question carries 14 marks. Draw neat and well labelled diagram wherever required.

Section - A

1. Describe economically important species of fresh water fishes. 14
2. Write a note on products and by products from poultry. 14

Section - B

3. Write a note on Fur producing animals. 14
4. explain processing of wool in detail. 14

Section - C

5. Write a note on milching breeds of cow. 14
6. Explain following.
 - a) Animals of leather industry 3
 - b) Tanning process 11

Section - D

7. Write a note on important breeds of swine. 14
8. Explain following pharmaceuticals and vaccines obtained from animals:-
 - a) Pharmaceuticals from animals 9
 - b) Vaccines from animals 5

Paper Code: 3105

Programme	Exam Code	Course Code
Bachelor of Science (Medical)	121303	✓ A/CE-3221
Bachelor of Science (Non-Medical)		
Bachelor of Science (Computer Science)		
Bachelor of Science (Economics)		
Bachelor of Commerce	121103	
Bachelor of Business Administration	121703	
Bachelor of Business Administration (Airlines and Airport Management)	509503	
Bachelor of Science (Home Science)	119703	
Bachelor of Science (Medical Laboratory Technology)	509703	
Bachelor of Science (Bio-Technology)	120603	
Master of Commerce (FYIP)	508303	
Master of Science (Mathematics) (FYIP)	508403	
Master of Science (Physics) (FYIP)	508603	

Semester-III

Course Title: Environmental Studies (Compulsory)
(260)

Time Allowed: 3 Hours**Max Marks: 35**

Note: Attempt five questions in all, selecting atleast one question from each section. The fifth question may be attempted from any section. Each question carries 7 marks.

Section A

1. What is the need for creating awareness about environment? Describe in detail. 7
2. What is Drought? Write its causes and effects. 7

Section B

3. What do you mean by desertification? What are its causes? 7
4. Write the methods of Conservation of Biodiversity? Explain with examples. 7

Section C

5. What do you mean by disaster? Describe the natural disasters. 7
6. What do you understand by Acid Rain? What are its effects? 7

Section D

7. What do you understand by population explosion? Give major causes of population Explosion. 7
8. Describe various Acts of Environment Protection. 7

Punjabi Version

Section A

1. ਵਾਤਾਵਰਣ (Environment) ਬਾਰੇ ਜਾਗਰੂਕਤਾ ਪੈਦਾ ਕਰਨ ਦੀ ਲੋੜ ਕਿਉਂ ਹੈ? ਇਸ ਦੀ ਵਿਸਥਾਰ ਨਾਲ ਵਿਆਖਿਆ ਕਰੋ। (7)
2. ਸੁਕਾੜ (Drought) ਕੀ ਹੁੰਦਾ ਹੈ? ਇਸ ਦੇ ਕਾਰਣ ਅਤੇ ਪ੍ਰਭਾਵ ਲਿਖੋ। (7)

Section B

3. ਰੇਗਿਸਥਾਨੀਕਰਨ (Desertification) ਨਾਲ ਤੁਸੀਂ ਕੀ ਸਮਝਦੇ ਹੋ? ਇਸ ਦੇ ਕਾਰਣ ਲਿਖੋ। (7)
4. ਜੈਵਿਕ ਵਿਭਿੰਨਤਾ ਦੇ ਸੰਰਕਸ਼ਣ (Conservation of Biodiversity) ਦੇ ਤਰੀਕੇ ਲਿਖੋ ਅਤੇ ਉਦਾਹਰਣਾਂ ਸਮੇਤ ਸਮਝਾਓ। (7)

Section C

5. ਆਫ਼ਤ (Disaster) ਨਾਲ ਤੁਸੀਂ ਕੀ ਸਮਝਦੇ ਹੋ? ਕੁਦਰਤੀ ਆਫ਼ਤਾਂ ਦੀ ਵਿਸਥਾਰ ਨਾਲ ਵਿਆਖਿਆ ਕਰੋ। (7)
6. ਐਸਿਡ ਰੇਨ (Acid Rain) ਨਾਲ ਤੁਸੀਂ ਕੀ ਸਮਝਦੇ ਹੋ? ਇਸ ਦੇ ਪ੍ਰਭਾਵ ਲਿਖੋ। (7)

Section D

7. ਆਬਾਦੀ ਵਿਸਫੋਟ (Population Explosion) ਨਾਲ ਤੁਸੀਂ ਕੀ ਸਮਝਦੇ ਹੋ? ਆਬਾਦੀ ਵਿਸਫੋਟ ਦੇ ਮੁੱਖ ਕਾਰਣ ਲਿਖੋ। (7)
8. ਵਾਤਾਵਰਣ ਸੁਰੱਖਿਆ ਨਾਲ ਸੰਬੰਧਿਤ ਵੱਖ-ਵੱਖ ਕਾਨੂੰਨ (Acts) ਦਾ ਵਰਣਨ ਕਰੋ। (7)

Hindi Version

Section A

1. वातावरण के प्रति जागरूकता पैदा करने की क्या जरूरत है?
इसे विस्तार से लिखें। 7
2. सूखा क्या होता है? इसके कारण और प्रभाव लिखें। 7

Section B

3. रेगिस्तानीकरण से आप क्या समझते हैं? इसके कारण लिखें।
7
4. जैविक विभिन्नता के संरक्षण के तरीके लिखें और उदहारण
सहित समझाएं। 7

Section C

5. आफत से आप क्या समझते हैं? कृदरती आफतों की विस्तार से
व्याख्या करें। 7
6. ऐसिड रेन से आप क्या समझते है? इसके प्रभाव लिखें। 7

Section D

7. आबादी विस्फोट से आप क्या समझते हैं? आबादी विस्फोट के
मुख्य कारण लिखें। 7
8. वातावरण सुरक्षा से संबंधित भिन्न-भिन्न कानून का वर्णन करें।
7