

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: 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)