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.

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 lamda 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
   i) less than 128
   ii) more than 175
   iii) 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.