Reg. No.: 2224059

Rajagiri College of Social Sciences (Autonomous)

First semester MCA Degree Examination

November, 2022

(Regular – 2022 admissions)

Code: 4351

Sub: (MCA101) Probability, Statistics and Computational Mathematics

Max. Marks: 75
Duration: 3 Hrs.

SECTION A

*Answer any **TEN** questions.*
(Each question carries 3 marks)

[10 X 3 = 30]

1. Define conditional probability.
2. In a binomial distribution with 6 independent trails, the probability of 3 and 4 successes is found to be 0.2457 and 0.0819 respectively. Find the parameters p and q of the binomial distribution.
3. What is scatter diagram? How is it useful in the study of correlation between two variables?
4. State and prove De-Morgan's law.
5. Discuss inclusion-exclusion principle.
6. Define Mutually Exclusive Events with an example.
7. What is the probability of guessing correctly at least 6 of the ten answers in a True-False objective test?
8. Find the range and the coefficient of range for the following observations.

   65, 70, 82, 59, 81, 76, 57, 60, 55 and 50
9. Symbolize the statement "All men are giants".
10. Explain addition rule of counting.
11. Given a Normal distribution with $\mu = 50$ and $\sigma = 8$ find the probability that X assumes a value between 34 and 62.
12. The number of ways in which 8 students can be seated in a line is?

SECTION B

*Answer **ALL** questions.*
(Each question carries 9 marks)

[5 X 9 = 45]

13 (a) Suppose that the reliability of a HIV test is specified as follows:
Of people having HIV, 90% of the test detect the disease but 10% go undetected. Of people free of HIV, 99% of the test are judged HIV negative but 1% are diagnosed as showing HIV positive. From a large population of which only 0.1% have HIV, one person is selected at random, given the HIV test, and the pathologist reports him/her as HIV positive. What is the probability that the person actually has HIV?

[OR]

(b) As you know, Covid-19 tests are common nowadays, but some results of tests are not true. Let's assume; a diagnostic test has 99% accuracy and 60% of all people have Covid-19. If a patient tests positive, what is the probability that they actually have the disease?

P.T.O

14 (a) A random variable X has the following probability distribution function. Find the value of k, and calculate mean and variance.

Value of X	-2	-1	0	1	2	3
P(X)	0.1	k	0.2	2k	0.3	k

[OR]

(b) From a lot of 30 bulbs which include 6 defectives, a sample of 4 bulbs is drawn at random with replacement. Find the probability distribution of the number of defective bulbs.

15 (a) Find the rank correlation coefficient between mark in English and Mathematics from the table below:

Mark in English	17	13	15	16	6	11	14	9	7	12
Mark in Mathematics	36	46	35	24	12	18	27	22	2	8

[OR]

(b) Calculate Pearson's coefficient of skewness for the following distribution of daily output in a factory.

Number of articles	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Number of workers	10	28	50	37	29	17	16	10	3

16 (a) i) Examine whether the statement $[p \rightarrow (\sim q \vee r)] \leftrightarrow \sim[p \rightarrow (q \rightarrow r)]$ is a tautology or contradiction

ii) Show that $R \rightarrow S$ can be derived from the premises $P \rightarrow (Q \rightarrow S)$, $\sim R \vee P$, and Q.

[OR]

(b) i) Without using truth table show that $p \leftrightarrow q \equiv (p \wedge q) \vee (\sim p \wedge \sim q)$

ii) Using truth table prove the logical equivalence $p \wedge (q \vee r) \equiv (p \wedge q) \vee (p \wedge r)$

17 (a) i) Using mathematical induction prove that $3^n - 1$ is a multiple of 2 for n = 1, 2, ...

ii) How many 6-digit numbers can be formed by using the digits 0, 1, 2, 3, 4, 5, 6, 7, 8 if every number is to start with '30' with no digit repeated?

[OR]

(b) There are 350 farmers in a large region. 260 farm beetroot, 100 farm yams, 70 farm radish, 40 farm beetroot and radish, 40 farm yams and radish, and 30 farm beetroot and yams. Let B, Y, and R denote the set of farms that farm beetroot, yams and radish respectively. Determine the number of farmers that farm beetroot, yams, and radish.

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Rajagiri College of Social Sciences (Autonomous)

First semester MCA Degree Examination

November, 2022

(Regular – 2022 admission)

Code: 4352 **Max. Marks: 75**

Sub: (MCA102) Data Structures using C **Duration: 3 Hrs.**

SECTION A

*Answer any **TEN** questions.*
(Each question carries 3 marks)

[10 X 3 = 30]

1 Convert x = ((12) * (34)) / (4-2) into postfix form.

2 What do you mean by self referential data structure?

3 Differentiate binary tree with binary search tree.

4 Explain post order traversal in binary search tree.

5 Write the union operation.

6 Give the structure used for representing a polynomial using array.

7 Define Circular Queue.

8 What do you mean by a Graph? Explain with example.

9 Brief on the different types of nodes present in a tree.

10 Differentiate between an unbalanced tree and a balanced tree.

11 What is the criteria for a Graph to become a tree?

12 Define the structure of B tree for internal node and leaf node.

SECTION B

*Answer **ALL** questions.*
(Each question carries 9 marks)

[5 X 9 = 45]

13 (a) Define array. Is it a data structure? Explain. What are the merits and demerits of array? Explain with program.

[OR]

(b) Explain the role of data structure in software development with any two real life situations.

14 (a) Illustrate and explain dynamic memory allocation functions with examples.

[OR]

(b) Write a program for the different cases of deleting a node in a linked list.

15 (a) Implement Stack using linked allocation.

[OR]

(b) Write a program to insert an element into a circular linked list.

P.T.O

16 (a) Write the program for displaying the elements in a binary search tree using a non-recursive inorder function.

[OR]

(b) Create binary search tree such that value greater than root will be stored in left sub tree and less than root will be stored in right sub tree. Write the inorder, preorder and postorder functions.

17 (a) Explain in detail B Trees with its advantages and disadvantages.

[OR]

(b) Specify the rules for inserting into a B Tree with example.

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Rajagiri College of Social Sciences (Autonomous)

First semester MCA Degree Examination

November, 2022

(Regular – 2022 admissions)

Code: 4353 **Max. Marks: 75**

Sub: (MCA103) Database Management System with SQL/PL- SQL **Duration: 3 Hrs.**

SECTION A

*Answer any **TEN** questions.*

(Each question carries 3 marks)

[10 X 3 = 30]

11 a) In an organisation several projects are undertaken. Each project can employ one or more employees. Each employee can work on one or more projects. Each project is undertaken on the request of a client. A client can request for several projects. Each project has only one client. A project can use a number of items and an item may be used by several projects. Draw an E-R diagram for the given scenario.

b) Explain:-

(i) Specialisation/Generalization.

(ii) Aggregation.

12 What is decomposition and how does it address redundancy?

13 Illustrate the different ways of inserting data into a table.

14 How do you enable, disable and drop triggers?

15 Explain in detail about the strict two-phase locking protocol.

16 Describe how to translate the following into relational tables with example.

(i)Entity Sets.

(ii) Relationship sets.

(iii)Relationship sets with key constraints and participation constraint.

17 What is functional dependency? Illustrate with an example.

18 Mention the different options in altering a table using the ALTER sql statement.

19 Illustrate any two loop structures in PL/SQL.

20 What are the different states of a transaction? Explain with necessary diagrams.

21 Give the significance of computing the closure of an attribute. Illustrate with an example.

22 Write the PL/SQL code to create a trigger that rasies an error, if the salary is below or beyond the valid range 0-5000 on the employee table while updating and inserting.

SECTION B

*Answer **ALL** questions.*
(Each question carries 9 marks)

[5 X 9 = 45]

13 (a) Define the role of Query Processor.

[OR]

(b) Write short notes on:

i) Query Optimization.

ii) Conceptual Schema

14 (a) With relevant examples, detail about lossless and lossy decompositions.

[OR]

(b) Define the Union and Decomposition rules used to infer the closure of FDs with example.

15 (a) For the following relation schema: employee(employee-name, street, city) works(employee-name, company-name, salary) company(company-name, city) manages(employee-name, manager-name) Give an expression in SQL for each of the following queries:

i. List the employees whose name starts with S.

ii. Find the names, street address, and cities of residence for all employees who work for 'First Bank Corporation' and earn more than $10,000.

iii. Find the names of all employees in the database who earn more than every employee of 'Small Bank Corporation'.

iv. List the companies whose employee average salary is greater than Rs.50,000/-

v. List the employees who live in the same city of their company.

[OR]

(b) What are nested queries? How would you use the operators IN, EXISTS and UNIQUE in nested queries.

16 (a) Write a trigger that will increase the price of a product by 10%, and update it in the database.

[OR]

(b) Differentiate between a function and a procedure? Illustrate how they are executed.

17 (a) What do you meant by log-based recovery?

[OR]

(b) Differentiate between a schedule and a transaction with an example.

Rajagiri College of Social Sciences (Autonomous)

First semester MCA Degree Examination

November, 2022

(Regular – 2022 Admissions)

Code: 4354 **Max. Marks: 75**

Sub: (MCA104) Data Communications and Computer Networks **Duration: 3 Hrs.**

SECTION A

*Answer any **TEN** questions.*

(Each question carries 3 marks)

[10 X 3 = 30]

1. We modulate several voice signals and send them through the air. Is this baseband or broadband transmission? Justify
2. Discuss the role of routing tables in switching techniques.
3. What is token passing? Explain.
4. What is hierarchical routing? Discuss with the help of an example.
5. What is MTU for an IP datagram?
6. Discuss the properties of a periodic analog signal.
7. What are the differences between parallel and serial transmission?
8. Define generation polynomial. Write the generator polynomial for CRC-32.
9. What do you mean by datagram subnet?
10. Compare and contrast between Multicasting and Multiple Unicasting.
11. What are the three major classes of guided media?
12. How the forwarding in Unicast and multicast communication is different?

SECTION B

*Answer **ALL** questions.*

(Each question carries 9 marks)

[5 X 9 = 45]

13. (a) How the transmission of binary data across a link is taking place? Explain.

[OR]

(b) Explain Pulse Code Modulation with basic architecture and an example.

14. (a) Distinguish between the twisted pair cable and the coaxial cable with ample diagrams.

[OR]

(b) Explain the packet switching and compare its delay with a circuit switched network.

P.T.O

15 (a) What are sliding window protocols? Explain in detail.

[OR]

(b) Discuss the HDLC protocol in detail.

16 (a) Explain the access method used in standard ethernet.

[OR]

(b) Explain in detail about the Wireless LAN Technology.

17 (a) Explain the two approaches in multicast routing in detail.

[OR]

(b) Discuss the structure of an IP datagram using a neat diagram.

Rajagiri College of Social Sciences (Autonomous)
First semester MCA Degree Examination
November, 2022
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Code: 4355 **Max. Marks: 75**
Sub: (MCA105) Operating Systems with Linux as Case study **Duration: 3 Hrs.**

SECTION A

*Answer any **TEN** questions.*
(Each question carries 3 marks)

[10 X 3 = 30]

1. Describe Swap-Space management.
2. Differentiate between TLB Hit and TLB Miss.
3. Write short notes on:- a) Process Creation, b) Process Termination.
4. Which are the rules associated with Resource Allocation Graph in order to detect whether a system is in a Deadlock or not?
5. Write the command with any three options which checks the system information in Linux.
6. What is Seek Time and Latency Time?
7. How do we ensure protection in a paging system?
8. Explain independent and co-operating Processes.
9. Explain the rules for Critical Section.
10. Explain the following Linux commands with at least one option a) head, b) tail.
11. What are the pros and cons of a contiguous file system?
12. Differentiate between Preemptable and Non Preemptable Resources.

SECTION B

*Answer **ALL** questions.*
(Each question carries 9 marks)

[5 X 9 = 45]

13. (a) Explain the following disk scheduling algorithms with the given sequence 28 16 52 15 80 46 182 16. Find the total head movement (cylinder spans from 0 to 199 and currently, head is at 100).
    - (i) LOOK
    - (ii) C-SCAN
    - (iii) C-LOOK

[OR]

(b) Explain with diagram different file access methods.

14 (a) Consider the following page reference string for a memory with three frames.

1, 2, 3, 4, 1, 2, 5, 1, 2, 3, 4, 5

How many page faults would occur for the following replacement algorithm?

i) LRU replacement.

ii) FIFO replacement.

iii) Optimal replacement.

[OR]

(b) What is Demand Paging? Detail the steps in handling a page fault?

15 (a) Explain the process cycle and state transition diagram. What are the contents in a process control block?

[OR]

(b) Explain concurrency control in detail with its problems and issues.

16 (a) If a new request from P1 arrives for the resources A, B, C, D are (1,1,0,0) on given below scenario; then will the system be in a safe state or not if it is granted using Banker's Algorithm?

Process	**Allocation**				**Maximum**				**Available**			
	A	**B**	**C**	**D**	**A**	**B**	**C**	**D**	**A**	**B**	**C**	**D**
P0	2	0	0	1	4	2	1	2	3	3	2	1
P1	3	1	2	1	5	2	5	2				
P2	2	1	0	3	2	3	1	6				
P3	1	3	1	2	1	4	2	4				
P4	1	4	3	2	3	6	6	5				

[OR]

(b) Explain the classical problem of Synchronization: Dining Philosophers Problem. How can it be solved?

17 (a) Explain exec family in Linux with code snippets.

[OR]

(b) Define an Access Matrix. How an access matrix can be implemented?