

Name:  
Reg. No. :

**Rajagiri College of Social Sciences (Autonomous)**  
**First Semester MCA Degree Examination**  
**January 2021**  
**(Regular – 2020 admissions)**

**Code: 3409**

**Sub: (MCA101) Probability, Statistics and Computational Mathematics**

**Max. Weightage: 30**

**Duration: 3 Hrs.**

**SECTION A**

*Answer any **TEN** questions.  
(Each question carries a weight of 1)*

[10 X 1 = 10]

- 1 What is the chance of picking a king from a pack of 52 cards?
- 2 Write briefly on the axiomatic approach to probability.
- 3 Illustrate the sample space when two dice are thrown.
- 4 Determine whether the following is a valid probability distribution or not. Justify your answer.

x	0	1	2
P(x)	0.25	0.6	0.15

- 5 Differentiate between continuous and discrete random variables. Give Examples.
- 6 If  $y = 5x - 20$  and  $\text{Mean}(x) = 30$  and  $\text{Variance}(x) = 5$ , Calculate Mean and Variance of  $y$ .
- 7 Calculate the geometric mean for 8, 24 and 40.
- 8 Express the statement "Pavan is Rich and Raghav is not happy" in symbolic form.
- 9 What are well formed formulas? Give two examples.
- 10 Illustrate the use of existential quantifier with a suitable example.
- 11 In how many ways can 6 books out of 10 different books be arranged in a book shelf so that 3 particular books are always together?
- 12 Solve for  $n$ , given  $nP4 = 30 \times nP2$ .

**SECTION B**

*Answer **ALL** questions.  
(Each question carries a weight of 4)*

[5 X 4 = 20]

- 13 (a) An urn contains 8 white and 3 red balls. If two balls are drawn at random, find the probability that
  - a) Both are white
  - b) One is of each color

**[OR]**

- (b) A company has two plants to manufacture scooters. Plant I manufactures 80% of the scooters and Plant II manufacturers 20%. At plant I, 85 out of 100 scooters are rated standard quality or better. At Plant II, only 65 out of 100 scooters are rated standard quality or better. What is the probability that the scooter selected at random came from Plant I if it is known that the scooter is of standard quality?

- 14 Given below is the probability distribution for number of students who failed in English.

x	0	1	2	3	4
P(x)	0.41	0.38	?	0.08	0.02

Find 1)  $P(X=2)$

2)  $P(X < 3)$

[OR]

- (b) The weekly wages for workers in a factory are distributed normally with mean Rs.1800 and standard deviation Rs.144. Within what range of wages will 95 percent of workers' wage lies?

- 15 (a) Calculate the mean for the following data:

X	5	10	15	20	25	30	35	40
F	6	17	28	34	18	11	9	7

[OR]

- (b) From the following data, obtain the regression equation for cost related to age. Estimate the maintenance cost of a car whose age is 10 yrs.

Age (in years) X	2	4	6	8
Maintenance Cost (in Rs) Y	10	20	25	30

- 16 (a) Examine whether  $(P \Lambda (P \leftarrow \rightarrow Q) \rightarrow Q)$  is a tautology.

[OR]

- (b) Prove that  $(PVQ) \Leftrightarrow \sim(\sim P \Lambda \sim Q)$ .

- 17 (a) A question paper is divided into three groups A, B, C which contains 4, 5, 3 questions respectively. An examinee is required to answer 6 questions taking atleast 2 from A, 2 from B and 1 from group C. In how many ways can he select the questions?

[OR]

- (b) 18 mice were placed in two experimental groups and one control group, with all groups equally large. In how many ways can the mice be placed into three groups?

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**Code: 3410** **Max. Weightage: 30**  
**Sub: (MCA102) Data Structures Using C** **Duration: 3 Hrs.**

**SECTION A**  
*Answer any **TEN** questions.  
(Each question carries a weight of 1)*

[10 X 1 = 10]

- 1 Define data structures and give its classification.
- 2 Illustrate the operations on a stack with a suitable diagram.
- 3 Write the prefix and postfix notation for the expression  $a^*b^c+d$ .
- 4 Analyze the result of each operation in the sequence PUSH(S,5), PUSH(S,2),  
PUSH(S,7), POP(S) on an initially empty stack.
- 5 What do you mean by a self-referential pointer? Give an example.
- 6 Implement an algorithm for enqueue operation.
- 7 Trace the binary search algorithm for the element 52 in the list  
23, 12, 3, 34, 52, 0, 10.
- 8 Define threaded binary tree with example.
- 9 Distinguish between left skewed and right skewed binary search tree with examples  
for each.
- 10 Compare and contrast red black trees with AVL trees.
- 11 Explain B-Tree with an example. What are the properties of B-Trees?
- 12 Discuss on the operations on a disjoint set.

**SECTION B**  
*Answer **ALL** questions.  
(Each question carries a weight of 4)*

[5 X 4 = 20]

- 13 (a) Give the three tuple representation of a sparse matrix with a suitable program.  
**[OR]**  
(b) Discuss polynomial multiplication using arrays with the help of a program.
- 14 (a) Write a program to implement priority queue using arrays.  
**[OR]**  
(b) Implement a program to demonstrate circular queue using arrays.

15 (a) With the help of a program discuss the forward and backward display of a doubly linked list.

**[OR]**

(b) Discuss in detail on the representation of a graph in the memory with suitable example.

16 (a) Construct an AVL tree with the following elements:

34, 26, 44, 40, 56.

Insert 65 and discuss the rotations used to balance the tree.

**[OR]**

(b) Illustrate with a recursive program the traversals in a binary search tree.

17 (a) What do you mean by a red black tree? Discuss the operations on a red black tree with the help of an example.

**[OR]**

(b) Construct a B-Tree with the following elements:

5, 9, 3, 7, 1, 2, 8, 6, 0, 4.

Discuss the uses of a B-Tree.

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**Code: 3411**

**Sub: (MCA103) Database Management Systems with SQL/PLSQL**

**Max. Weightage: 30**

**Duration: 3 Hrs.**

**SECTION A**

*Answer any **TEN** questions.  
(Each question carries a weight of 1)*

[10 X 1 = 10]

- 1 Explain the distinctions among the terms primary key, Foreign key, candidate key, composite key and super key. Give relevant examples.
- 2 Define arity and degree of a relation.
- 3 How are primary keys related to functional dependency?
- 4 Explain Multivalued Dependency and Join Dependency.
- 5 Illustrate any 4 date manipulation functions in SQL.
- 6 What do you mean by self-join? Give example.
- 7 What is a privilege? How can you grant or revoke privileges?
- 8 Illustrate with example how functions are called in a PL SQL block.
- 9 How can we check whether a cursor is open? Illustrate.
- 10 Explain 3 basic parts of a trigger.
- 11 Explain the distinction between the terms serial schedule and serializable schedule.
- 12 What benefits does two phase locking protocol provide? What disadvantages result.

**SECTION B**

*Answer **ALL** questions.  
(Each question carries a weight of 4)*

[5 X 4 = 20]

- 13 (a) Discuss the advantages of DBMS over file processing system. Explain the difference between physical and logical independence.

**[OR]**

- (b) Describe how to translate Weak Entity Sets, class hierarchies and aggregation in an ER diagram to relational table with example.

- 14 (a) Illustrate with examples redundancy and the problems/ anomalies it can cause. Can null values help in addressing these problems?

**[OR]**

- (b) Define the minimal cover for a set of FDs. Explain the algorithm for obtaining the minimal cover of a set of FDs and how it is used for dependency preserving decomposition to 3NF.

**P.T.O**

15 (a) What aggregate operators does SQL Support? Explain the Group by having clause. Mention any restrictions that must be satisfied by the fields that appear in the Group by clause.

[OR]

(b) Write SQL statements for following:

Student (Enrno, name, courseId, emailId, cellno)

Course (courseId, course\_nm, duration)

- i) Add a column city in student table.
- ii) Find out list of students who have enrolled in “computer” course.
- iii) List name of all courses with their duration.
- iv) List name of all students start with “a”.
- v) List email Id and cell no of all mechanical engineering students.

16 (a) Write PL/SQL procedure to read student roll number from user, fetch marks from student table for this student, compute grade and update the grade column of the table. STUDENT (roll number, name, marks1, marks2, marks3, marks4, grade) [ follow regular convention for student grades(A,B,C,D,F) ]

[OR]

(b) Explain the steps to be followed while working with a cursor. Write a cursor for retrieving and displaying customer name and address from the customer table in a user defined format.

17 (a) List out and explain the ACID properties of Transaction Management.  
What are the anomalies caused due to interleaved transaction execution?

[OR]

(b) What is need of lock in DBMS? Explain shared lock and exclusive lock with the help of example

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**Code: 3412**

**Sub: (MCA104) Data Communications and Computer Networks**

**Max. Weightage: 30**

**Duration: 3 Hrs.**

**SECTION A**

*Answer any **TEN** questions.  
(Each question carries a weight of 1)*

[10 X 1 = 10]

- 1 List and explain three essential components of a communication system.
- 2 What is half-duplex mode of communication?
- 3 What is Circuit Switching?
- 4 List any three guided transmission media.
- 5 Differentiate between Node and Link
- 6 Differentiate between Pure ALOHA and Slotted ALOHA.
- 7 Define Path Vector.
- 8 Define Unicast Routing.
- 9 What is Link State?
- 10 Why do we need routing?
- 11 How many classes are there for IP addresses? Give the ranges for each class.
- 12 What is Multicasting?

**SECTION B**

*Answer **ALL** questions.  
(Each question carries a weight of 4)*

[5 X 4 = 20]

- 13 (a) With neatly sketched diagram, explain in detail the TCP/IP reference model.

**[OR]**

- (b) Differentiate between Analog and Digital Signals. Explain how analog signals are converted to digital and vice-versa.

- 14 (a) Define Switching. Explain the difference between Circuit Switching and Packet Switching techniques.

**[OR]**

- (b) What is Multiplexing? With a suitable example and neatly sketched diagram, explain Multiplexing.

15 (a) Explain different types of error correction and detection techniques.

**[OR]**

(b) With a suitable example, explain Go-Back-N and Selective Repeat Protocols.

16 (a) Explain in detail the services offered by Network Layer.

**[OR]**

(b) Explain Unicast Routing Algorithms.

17 (a) Explain in detail, various functionalities and protocols offered in the Data Link Layer of OSI model.

**[OR]**

(b) What is Internet Protocol? List and explain different classes of IP addresses with suitable example.

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**Code: 3413**

**Sub: (MCA 105) Operating Systems with Linux as Case study**

**Max. Weightage: 30**

**Duration: 3 Hrs.**

**SECTION A**

*Answer any **TEN** questions.  
(Each question carries a weight of 1)*

[10 X 1 = 10]

- 1 Describe Latency.
- 2 What do you mean by cylindrical skew?
- 3 Write notes on Address Binding.
- 4 Discuss the file system of Linux OS.
- 5 Explain the attributes of PCB.
- 6 What do you mean by cooperating process?
- 7 Explain a resource allocation graph with example.
- 8 Explain the role of valid and invalid bit.
- 9 Explain the process of revocation of process rights.
- 10 Explain any two filters in Linux operating system.
- 11 Describe the domain of protection.
- 12 With a neat sketch, explain in detail the life cycle of an I/O request.

**SECTION B**

*Answer **ALL** questions.  
(Each question carries a weight of 4)*

[5 X 4 = 20]

- 13 (a) Given memory partitions of 100kb, 500kb, 200kb, 300kb and 600kb in order, how would each of the first-fit, best-fit and worst-fit algorithms place processes of 212 kb, 417kb, 112kb, and 426 kb in order? Detail each allocation with the help of diagrams.

**[OR]**

(b) With 2 options, explain the following commands.

- i. ls
- ii. cut
- iii. paste
- iv. cd
- v. cat

**P.T.O**

14 (a) Under what circumstances do page fault occur? Describe the actions taken by the operating system when a page fault occurs.

[OR]

(b) Explain the concept of Paging with a standard paging model. How is the page table implemented?

15 (a) Explain Non-preemptive and Preemptive SJF, Non-preemptive and preemptive Priority process scheduling algorithms.

[OR]

b) Consider a set of processes given below. Using Gantt chart traverse each algorithm using FCFS and round robin with the example and find out the average waiting time and average turnaround time.

Process	Arrival Time	Burst Time
P1	0	8
P2	1	5
P3	3	7
P4	5	2
P5	6	4

16 (a) An instance of system is given below

5 processes P0 through P4;

3 resource types: A (10 instances), B (5instances), and C (7 instances)

Snapshot at time T0:

	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P0	0	1	0	7	5	3	3	3	2
P1	2	0	0	3	2	2			
P2	3	0	2	9	0	2			
P3	2	1	1	2	2	2			
P4	0	0	2	4	3	3			

Can request for (3,3,1) by P4 be granted? Substantiate your answer.

[OR]

(b) Write a shell script that will display all the files in the current directory to which you have read, write & execute permission.

17 (a) Explain the access matrix implementation with various rights.

[OR]

(b) Write short notes on:-

- i. Administering users and groups in Linux.
- ii. Root account.