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**II Semester MCA Degree Examination December- 2024
COMPUTER SCIENCE**

**Data Base Management System
(CBCS Scheme Non NEP Y2K20)
Paper : 2 MCA 2**

Time : 3 Hours**Maximum Marks : 70**

Instruction to Candidates:

- 1) Answer All Sections.
- 2) Answer any Five questions from Section - A, each carries Six marks.
- 3) Answer any Four questions from Section - B, each carries Ten marks.

SECTION -A

I. Answer any Five of the following questions. Each carries 6 marks. $(5 \times 6 = 30)$

1. What is database instance? Explain advantages and disadvantages of DBMS.
2. Define data model? Discuss different types of data model with examples.
3. What is an attribute? Describe different types of attributes with examples.
4. Illustrate Hash index and Bit map index.
5. Write a note on outer join and its types in relational algebra with examples.
6. Consider a schema $S = (U, V, W, X, Y, Z)$ on which the following functional dependencies hold $\{U \rightarrow V, VW \rightarrow X, Y \rightarrow W, X \rightarrow U\}$. Find how many no. of candidate keys in S.
7. Define the term transaction. Demonstrate different states of transaction with a neat diagram.
8. Explain validation concurrency control protocol with an example.

**SECTION-B****II. Answer any Four full questions.**

(4×10=40)

9. a) What is data independence ? Write short notes on types of data independence.
b) Explain roles and responsibilities of DBA.
10. a) Explain hashing techniques with examples.
b) Draw an E-R diagram for Bank database with four entities having six attributes each.
11. a) Explain division operator and cartesian product operator with a suitable example.
b) Discuss the following keys with an appropriate example.
 - i) Candidate key
 - ii) Primary key
 - iii) Foreign key
12. a) Briefly explain any five aggregate functions in SQL with examples.
b) Explain fourth normal form and fifth normal form with table example
13. Consider the following schema and answer the queries.

EMPLOYEE

NAME	VARCHAR (30)	NOT NULL,
EID	VARCHAR (10)	NOT NULL,
DEPTNO	INT (5)	NOT NULL,
HODEID	VARCHAR (10),	
SALARY	INT (10),	

PRIMARY KEY (EID),

FOREIGN KEY (HODEID) REFERENCES EMPLOYEE (EID),

FOREIGN KEY (DEPTNO) REFERENCES DEPARTMENT (DID);

DEPARTMENT

DID	INT (5)	NOT NULL,
DNAME	VARCHAR (30)	NOT NULL,
HODID	VARCHAR (10)	NOT NULL,
HODNAME	VARCHAR (30),	

PRIMARY KEY (DID),

UNIQUE (DNAME)

FOREIGN KEY (HODID) REFERENCES EMPLOYEE (EID);

PROJECT WORK

EMPID VARCHAR (10) NOT NULL,

PROJNO INT (5) NOT NULL,

PROJECTLOC VARCHAR (30) NOT NULL,

PRIMARY KEY (EMPID, PROJNO),

FOREIGN KEY (EMPID) REFERENCES EMPLOYEE (EID);

- a) Retrieve the distinct employee ID (EMPID) of all employees of university who are working on project No.20, 30 and 40.
 - b) To find the sum of salaries of all employees of the English department as well as the maximum, minimum and average salary in English department.
 - c) Return the employee ID and name of employees whose salary is greater than the salary of all employees in department number 20 of university. Order result by employee ID
 - d) Drop the 'SALARY' column from 'EMPLOYEE' table.
 - e) Write a query for this scenario that University decided to give all employees in the 'SCIENCE' department a 20% rise in salary.
14. a) Explain time stamp ordering protocol with example
b) Explain database backup and recovery from catastrophic failures
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I Semester M.C.A. Degree Examination May/June - 2025
COMPUTER APPLICATIONS
Data Structure
(CBCS Y2K21 Scheme)
Paper : 1MCA6

Time : 3 Hours

Maximum Marks : 70

Instructions to Candidates :

Answer All parts.

PART - A

Answer any Five of the following. Each question carries 6 marks. $(5 \times 6 = 30)$

1. What is data structure? Explain the classification of data structure with example.
2. Discuss the string operations with built-in functions in C language
3. What is array? Explain array as ADT.
4. Write an algorithm to insert an element into the QUEUE and delete an element from the QUEUE.
5. Explain different tree traversal algorithms with example.
6. Discuss topological sorting with example.
7. What is hashing? Discuss the collision resolution techniques.
8. Write and explain insertion sort algorithm.

PART - B

Answer any Four questions. Each question carries 10 marks. $(4 \times 10 = 40)$

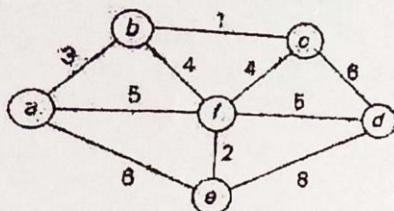
9. a) Explain asymptotic notations.
b) Explain any one pattern matching algorithm. $(6+4)$
10. a) Write an algorithm to convert infix expression to postfix expression using Stack.
b) Write a C Program to create a singly linked list and insert an element at the end of the linked list. $(5+5)$
11. a) Explain different types of queues with example.
b) Discuss the how linked list is differ from array. $(5+5)$



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12. a) What is AVL tree? Create AVL tree from the give elements: 45, 23, 67, 89, 91, 65, 35, 40, 12.
b) Discuss traversal of the following graph using BFS. (6+4)



13. a) Explain B tree and mention its applications.
b) Write binary search algorithm with its time complexity. (5+5)
14. a) Sort the following array using merge sort. 78, 82, 27, 90, 12, 63, 87 58, 43
b) Write a short note on divide and conquer technique. (5+5)
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I Semester M.C.A. Degree Examination, May/June - 2025
COMPUTER APPLICATIONS
Object Oriented Programming
(CBCS Y2K21 Scheme)
Paper : 1MCA5

Time : 3 Hours**Maximum Marks : 70****Instructions to Candidates :**

Answer all the Sections.

SECTION - AAnswer any **Five** questions. Each question carries **6** marks.

(5×6=30)

1. Define Inheritance. Explain the types of Inheritance
2. Explain constructors in Java with example.
3. Explain runtime polymorphism with example program.
4. What is a package? Explain how to create and execute user defined package.
5. Write a Java program to demonstrate string class and string methods.
6. Write a note on Applet Life Cycle.
7. Define final variable, final method and final class with example.
8. Explain five methods of graphics class with examples.

SECTION - BAnswer any **Four** questions. Each question carries **10** marks.

(4×10=40)

9. Explain features of Java Language.
10. Explain the ways of creating threads in Java
11. Explain exception handling in Java.
12. With Neat diagram briefly explain Life cycle of a thread.
13. a) Write a Java program to demonstrate static member data and static member methods.
b) Explain character stream and byte stream classes. (5+5)
14. Write a short notes on:
 - a) Method overloading and method overriding.
 - b) Arrays and Types of Arrays. (5+5)



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II Semester M.C.A. Degree Examination December - 2024**COMPUTER SCIENCE****Operating Systems****(CBCS Scheme Y2k20)****Paper : 2MCA1****Time : 3 Hours****Maximum Marks : 70****Instructions to Candidates :**

1. Answer any Five questions From Part - A.
2. Answer any Four sub questions from Part - B.

PART-A**Answer any Five questions :****(5×6=30)**

1. Define operating system. Explain the functions of operating system.
2. Explain dual mode operation with a neat diagram.
3. What are system calls? Briefly point out its types.
4. What is Deadlock? Explain the necessary conditions for deadlock to occur.
5. What is thrashing? How can it be controlled?
6. Describe both internal and external fragmentation problems encountered in a contiguous memory allocation scheme.
7. Draw the logical view of segmentation and explain.
8. Write the Need and Goals of protection in OS.

PART - B**Answer any Four questions :**

9. a) Explain all the information associated with a specific process in PCB. (4)
b) What are Monitors? Explain Dining Philosopher's problem with solution using monitor. (6)
10. a) Define Process. Explain the states of process. (5)
b) Define semaphores. Explain Reader-Writer problem with semaphore in detail. (5)

[P.T.O.]

11. a) Consider the following page reference stream : 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1. How many page faults would occur for LRU and FIFO replacement algorithms assuming Three Frames? Which one of the above is most efficient? (7)
- b) What are Virtual machines? Explain the benefit of creating virtual Machines. (3)
12. a) Explain various techniques of Disk Management in mass storage structure. (3)
- b) Define Paging. Explain the Address Translation in paging. (7)
13. Consider the following snapshot of a system:

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

- a) Calculate the content of the need matrix? (4)
- b) Is the system in a safe state? (3)
- c) Determine the total amount of resources of each type? (3)
14. a) Consider the processes P1, P2, P3, P4 given in the below table, arrives for execution in the same Order, with arrival time 0 and given burst time. Find the Average waiting time and Turnaround Time using FCFS scheduling algorithm. (5)

Process	Burst Time
P1	21
P2	3
P3	6
P4	2

- b) Write a short notes on : Context Switch and Access Matrix. (5)



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I Semester M.C.A. Degree Examination, May/June - 2025
COMPUTER APPLICATIONS
The Art of Programming
(CBCS Scheme Y2K21)
Paper : 1MCA1

Time : 3 Hours

Maximum Marks : 70

Instructions to Candidates :

Answer All Parts.

PART - A

Answer any Five questions. Each question carries Six marks.

(5×6=30)

1. Describe and compare the standard asymptotic notations used to express the lines complexity of algorithms.
2. Write an algorithm to find $1^2+3^2+5^2+\dots+n^2$.
3. Write an Algorithm to reverse the digits of an integer check for the input 9876.
4. Give an example for pass by Value and pass by reference. Discuss the differences.
5. What is the advantage of Binary Search? Write the Binary Search Algorithm.
6. Write an Algorithm to generate Pseudo random number.
7. Explain the impact of control and Branching structure is programming.
8. What is pattern searching? How do you search for a keyword in a given text?

PART - B

Answer any Four questions. Each question carries Ten marks.

(4×10=40)

9. a) Write an algorithm for converting decimal number to binary.
b) Discuss with example command line arguments.

[P.T.O.]



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10. a) Write an Algorithm for generating 4th fibonacci number.
- b) Explain two-way merge with an example. (5+5)
11. Write an Algorithm to remove duplicates from a given list. Trace your Algorithm for the following list. 1 22 41 5 6 7 7 8 9 9 9. (10)
12. Write Insertion sort Algorithm. Trace the algorithm taking an example of 8 numbers. (10)
13. Write an algorithm for multiplication of two matrices. (10)
14. Write an Algorithm to find maximum number and a given list. Trace your algorithm for the following list. {7, 6, 12, 1, 4, 3, 2}. (10)
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**I Semester M.C.A. Degree Examination May/June - 2025
COMPUTER APPLICATIONS**

**Theory of Computation
(CBCS 2020-21 Scheme)
Paper : 1MCA4**

Time : 3 Hours

Maximum Marks : 70

Instructions to Candidates :

- 1) Answer any **five** questions from Section - A, each question carries **6** marks.
- 2) Answer any **four** questions from Section-B, each question carries **10** marks.

SECTION - A

Answer any **Five** of the following questions. Each question carries **6** marks. **(5×6=30)**

1. Differentiate between DFA, NFA and $\in - NFA$.
2. Design a DFA that accepts binary strings divisible by 5. Verify the string “1101” is accepted or not.
3. Define Regular expression. Show that the language $L = \{ww \mid w \in \{a,b\}^*\}$ is not regular.
4. What you mean by ambiguity of grammar? Check whether below grammar is ambiguous

$$S \rightarrow aY|bX$$

$$X \rightarrow aS|bXX|a$$

$$Y \rightarrow bS|aYY|b$$

On string “aabab”

5. Briefly explain Universal languages and Linear Bounded Automata.
6. What is Turing machine? Explain different types of Turing machines.
7. Simplify the following grammar by eliminating left recursion

$$S \rightarrow Ab|a$$

$$A \rightarrow Ab|Sa$$

8. Prove that complement of recursively enumerable language is recursive.



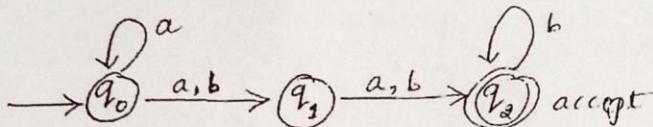
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SECTION - B

Answer any **Four** of the following questions. Each question carries **10** marks. ($4 \times 10 = 40$)

9. a) What is Finite Automata? Explain the applications of finite automata. (4)
b) Convert the following NFA to equivalent DFA. (6)



10. a) Obtain an NFA which accepts strings of a's & b's starting with string "ab". (5)
b) Show that regular languages are closed under union, concatenation and star operations. (5)
11. a) Convert the following CFG to CNF (6)

$$S \rightarrow 0A|1B$$

$$A \rightarrow 0AA|1S|1$$

$$B \rightarrow 1BB|0S|0$$

- b) Write a note on Mealy and Moore machine. (4)
12. a) What is PDA? Obtain a PDA to accept the Language $L = \{0^n 1^n \mid n \geq 1\}$ by a final state. Verify the string "000111" is accepted or not. (7)
b) Briefly explain Instantaneous Description of PDA. (3)
13. Design a Turing machine to accept the language $L = \{0^n 1^n \mid n \geq 1\}$ and verify the string "0011" is accepted or rejected. (10)
14. Write a note on:
a) Pumping Lemma for regular languages.
b) Halting problem in Turing machine. (5+5)
