

8. (a) Define Boolean algebra. State and prove De-Morgan's laws of Boolean algebra.

(b) Write a short note on logic gates and circuits.

9. (a) What are tautology; conditional and biconditional statements? Construct truth table for $(p \vee q) \vee \sim p$.

(b) Discuss Integral domain and irreducible polynomials.

10. (a) Define a field. Let p be a prime number. Prove that the set of integers I_p :

$$I_p = \{0, 1, 2, 3, \dots, p-1\}$$

forms a field with respect to addition and multiplication modulo p .

(b) Suppose $f(t) = 2t^3 - 3t^2 - 6t - 2$. Find all the roots of $f(t)$ knowing that $f(t)$ has a rational root.

(01/13-II)

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^{2nd} M.C.A. (Year)/M. Sc. (Comp. Sc.)

(Second Year) EXAMINATION

(New Scheme)

MCA/MSc-DE-21

DISCRETE MATHEMATICAL STRUCTURES

Time : Three Hours Maximum Marks : 70

Note : Attempt any Five questions. All questions carry equal marks.

1. (a) Define a group. Let S be the set of 2×2 matrices with rational entries under the operation of matrix multiplication. Is S a group? Explain.
(b) Explain permutation groups, semi-groups and free semi-groups along with one example for each.

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2. (a) Define normal subgroups. Prove that a subgroup H of a group G is normal if and only if $g^{-1}hg \in H$ for every $h \in H$, $g \in G$.
- (b) Explain error correcting codes.

3. (a) Define language of grammar. Also discuss classification of grammars.

(b) Explain state table and state diagram of a finite-state machine. Give state table for a finite-state machine M with two input symbols, three internal states and two output symbols.

4. Discuss the following along with one example for each : Directed and undirected graphs; Degree of a vertex; Paths and cycles; and regular graphs.

5. (a) What is adjacency matrix representation ? Draw the directed graph G whose adjacency matrix is :

$$\begin{bmatrix} 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 0 & 0 & 1 \end{bmatrix}$$

- (b) Write an algorithm for finding minimal path.
6. (a) Write a short note on flow in networks.
 (b) Define partial ordering and lattices. Show that " \leq " (less than or equal to) is a partial ordering on the set of positive integers.
7. (a) Define a Hasse diagram and draw it for $(P(A), \subseteq)$, where $A = \{0, 1, 2\}$.
 (b) If L be any lattice, then for any $a, b, c \in L$, prove :

- (i) $a \vee a = a$; $a \wedge a = a$;
 (ii) $a \vee (a \wedge b) = a$.

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2212

^{2nd}
M.C.A. (~~1st~~ Year)/M.Sc. (Comp. Sc.)

(Second Year) EXAMINATION

(New Scheme)

DATA STRUCTURE

MCA/M.SC.-DE-22

Time : Three Hours

Maximum Marks : 70

Note : Attempt any Five questions.

1. Explain various operations on linear arrays. 7
2. Describe various ways for implementing graphs in memory. 7
3. (a) Explain various applications of queues. 2
(b) Write algorithm for converting arithmetic expression from infix notation to polish notation. 5

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P.T.O.

4. Compare all the sorting algorithm with respect to their complexity and justify your answer which sorting algorithm is best suited for which type of data. 7
5. What do you mean by hashing ? Explain linear probing and double hashing. 7
6. Define Heap. Write an algorithm to implement heat sort. 7
7. Write a recursive function that prints the keys of a linear singly linked list on reverse order. 7
8. Write algorithm for implementing parathesis checker application of stacks. 7
9. Define the following terms related to graphs :
 - (a) Outdegree and Indegree
 - (b) Source and Sink
 - (c) Hamiltonian path. 7
10. Explain the algorithm for post order traversal algorithm of a binary tree. Also execute the algorithm with an example. 7

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2213

M.C.A. (~~1st~~ 2nd Year)/M.Sc. (Comp. Sc.)

(Second Year) EXAMINATION

(New Scheme)

MCA-MSC-DE-23

OBJECT ORIENTED METHODOLOGY

USING C++

Time : Three Hours Maximum Marks : 70

Note : Attempt any Five questions. All questions carry equal marks.

1. Differentiate between the following :
 - (a) Abstraction and encapsulation 5
 - (b) Abstract class and concrete class 4
 - (c) Meta class and container class. 5

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2. Explain the following terms with suitable examples : link, association, multiplicity, link attribute, qualifier, ordering and aggregation. 14
3. What are two main processes of Booch's methodology ? Explain the subphases of each process in sufficient detail. 14
4. What is functional model ? What is DFD ? Draw '0'-level and '1'-level DFD for a library management system. 14
5. What is OMT ? What is Object Model of OMT ? Draw an object diagram for university admission system. 14
6. (a) What are different types of access specifiers in C++ ? Explain with an example. 7
 (b) What is inheritance ? How is it implemented in C++ ? 7
7. What are constructors ? What are their roles ? How are they different from destructors ? 14
8. What is operator overloading ? Give one example of unary and one example of binary operator overloading. 14
9. (a) What is friend function ? Explain its need. 7
 (b) What is pure virtual function ? Explain its use with an appropriate example. 7
10. (a) What is template class ? Give an example. 7
 (b) Exception the use of 'try', 'catch' and 'throw' key words. 7