

Roll No. :

Total No. of Questions : 11]

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BFMS-474

M.Sc. (Final) Examination, 2023

INFORMATION TECHNOLOGY

Paper - MIT-205

(Discrete Mathematics and Iterative Methods)

Time : 3 Hours]

[Maximum Marks : 50

Section-A

(Marks : 2 × 10 = 20)

Note :- Answer all *ten* questions (Answer limit **50** words). Each question carries **2** marks.

Section-B

(Marks : 3 × 5 = 15)

Note :- Answer all *five* questions. Each question has internal choice (Answer limit **200** words). Each question carries **3** marks.

Section-C

(Marks : 5 × 3 = 15)

Note :- Answer any *three* questions out of five (Answer limit **500** words). Each question carries **5** marks.

Section-A

1. (i) Define infinite sets with a suitable example.
- (ii) Write the truth table for the following :

$$(P \vee Q) \wedge Q$$

where P and Q are two propositions.

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- (iii) Define complexity of algorithms.
- (iv) What do you mean by Cardinality ?
- (v) How many different Binary strings are possible using four binary bits ?
- (vi) What do you mean by sum of products form ?
- (vii) What is the major difference between DFS and BFS ?
- (viii) Give an example of bipartite graph.
- (ix) Give an application of cubic spline interpolation.
- (x) What do you mean by Newton–Raphson method ?

Section–B

2. Prove the following using mathematical induction :

$$1 + 3 + 5 + \dots + (2n - 1) = n^2$$

where $n \geq 1$.

Or

Explain the concept of Venn diagrams using suitable examples.

3. Check the relation ‘is equal to’ (=) on the set of real numbers is equivalence or not.

Or

What are the applications of matrices in Computer Science ?

4. Suppose there are eight students in a class, at least how many students will have the same birth week-days ?

Or

Prove the following :

$$\binom{n}{k} = \frac{n!}{(n-k)!k!}$$

5. Compare Kruskal’s and Prim’s algorithms.

Or

Explain Warshall's algorithm using suitable example.

6. Solve the following set of equations using Gaussian method :

$$x + y + z = 2$$

$$x + 2y + 3z = 5$$

$$2x + 3y + 4z = 11$$

Or

Use Trapezoidal rule with $m = n = 2$ to evaluate the following integral :

$$\int_0^{1/2} \int_0^{1/2} e^{y-x} dy dx$$

Section-C

7. Write the truth tables for conjunction, disjunction, conditional, biconditional, converse, inverse and contrapositive.
8. Write a recursively defined function to find the factorial of a number and find its complexity.
9. Draw the Hasse diagram representing the divisibility relation on the following set. Also find supremum and infimum if they exist :

$$A = \{1, 2, 3, 4, 6, 12, 24\}$$

10. Explain the following using suitable examples :
- (a) Hamiltonian graph
 - (b) Multigraph
 - (c) Binary tree
 - (d) Isomorphic graph
11. Explain the concept of finding eigenvalue of a matrix by power method.