PB 5709

Roll No. _____ Total No. of Pages: 04

M.A./M.Sc. (Semester - II) Examination - June - 2026
Mathematics
PAPER - MATH 2C4
Methods of Applied Mathematics-II

Time Allowed: Three Hours **Max. Marks: 100**

This question paper contains two sections as under

Section - A **Max. Marks-20**

This section will have 10 questions, having 02 questions from each unit with no internal choice. Answer in about 20 words. All questions will have equal marks. (10×2=20)

Section - B **Max. Marks-80**

This section will have 10 questions, having 02 questions from each unit, one question to be attempted from each unit. Words limit approximately 400-500 words. Questions may have sub divisions. All questions will have equal marks. (16×05=80)

Section-A

1. i) Let x = {a, b, c}. Define F: x → x such that F = {(a,b), (b,a), (c,c)}. Determine F^{-1} and F^2.

   ii) Verify that the proposition $p \vee \neg(p \wedge q)$ is tautology.

   iii) Define distributive Lattice.

   iv) Define Partially ordered set.

   v) Define complete graph.

   vi) Define regular graph.

   vii) Define tree.

   viii) Define binary search tree.

   ix) Write Leibniz rule for fractional derivatives.

   x) Write two properties of fractional derivatives.

Section-B

Unit-I

2. i) Among integers 1 to 300, how many of them are divisible by 3, nor by 5, nor by 7? How many of them are divisible by 3 but not by 5, nor by 7? 8

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ii) Among the two restaurants next to each other, one has a sign that says 'Good food is not cheap' and other has a sign that 'Cheap food is not good'. Investigate the signs regarding their equivalence. 8

OR

3. i) Find the minimum number of students in a class to be sure that three of them are born in the same month. 4

ii) Find the conjunctive normal form and disjunctive normal form for 12

a) $p \wedge (p \rightarrow q)$

b) $p \leftrightarrow (\bar{p} \vee \bar{q})$

Unit-II

4. i) Let L be a lattice. Then $a \wedge b = a$ *iff* $a \vee b = b$ 8

ii) Express $E = (xy' + xz) + z'$ in its complete product of sum form. 8

OR

5. i) Let L be a bounded distributive lattice. Then complements are unique if they exist. 8

ii) Find the simplified Boolean function represented by the following truth table : 8

A	B	C	F(A, B, C)
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

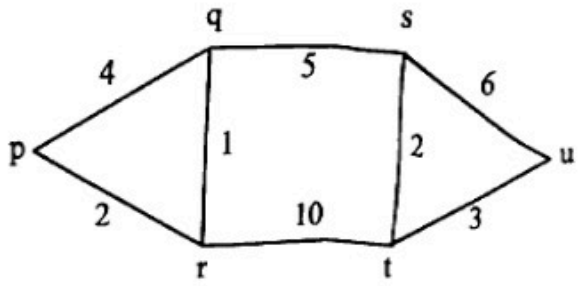
Unit-III

6. i) A simple graph with n vertices and k components have at most (n-k) (n-k+1) /2 edges. 8

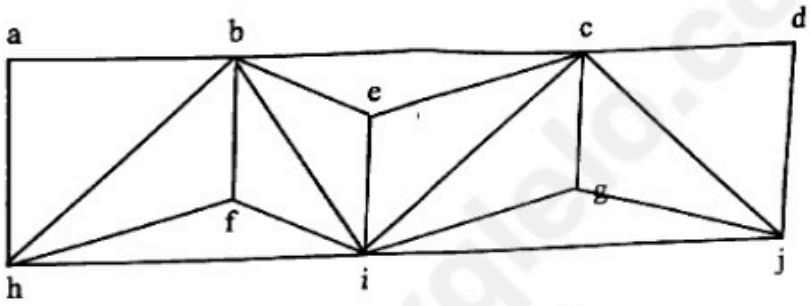
ii) Draw a graph which is Eulerian as well as Hamiltonian. 8

OR

7. i) What is the length of the shortest path between the vertices p and u in the following weighted graph? 8



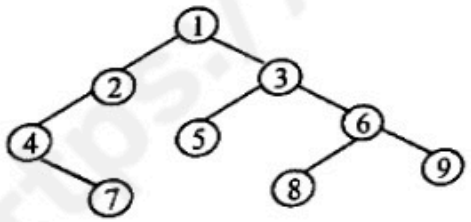
ii) Paint the graph with proper colors and find the chromatic number in the following graph. 8



Unit-IV

8. i) Prove that every tree has either one or two centres. 8

ii) Traverse the following tree in inorder, preorder and post order. 8



OR

9. i) Let T be a binary tree of n vertices and of height h, then $h+1 \le n \le 2^{h+1}-1$ 8

ii) Write the difference between binary tree and complete binary tree. Also display a binary tree with 11 vertices and height 5. 8

Unit-V

10. i) Derive Laplace transform of Caputo's fractional derivative. 8

ii) Find G-L fractional derivative of $(x-a)^n$ of order α. 8

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OR

11. i) Derive Fourier transform of R-L fractional derivative. 8

ii) Evaluate : ${}_{a}I_{x}^{\alpha}\left(x^{h}\right)$ 8

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