Total number of printed pages-02

2(Sem-8/FYUGP)BNC(A)/DSCI

2025

COMPUTER SCIENCE

(Discipline Specific Core)

Paper Name: Mathematics-II

Paper Code: **BCA-DSC-146**

Full Marks: 60

Time: Two and Half Hours

(*The figures in the margin indicate full marks for the questions)*

Answer in English

1. Answer the following questions : 1x7=7

(a) State Pigeonhole principle.
(b) Define cycles in graph theory.
(c) Number of odd degree vertices in a graph is even. (True/False).
(d) Find the value of $\lim_{x\to 3} \frac{x^2-9}{x-3}$?
(e) State Rolles' Theorem.
(f) What does Tautology mean in mathematical Logic ?
(g) Define connectives in mathematical logic.

2. Answer the following questions : (Any four) 2x4=8

(a) Define Complete graph and draw K_4.
(b) Simplify the statement: $(p \vee q) \wedge (\sim p)$.
(c) Find $\frac{dy}{dx}$, $y = sin^{-1}(cos3x)$.
(d) Find the value of $n_{c_r} + n_{c_{r+1}}$.
(e) A non-directed graph G has 8 edges. Find the number of vertices, if the degree of each vertex in G is 2.

3. Answer the following questions (any three) 5x3=15

(a) Verify 'Mean value theorem' for the function
$$f(x) = x^2 - 4x - 3 \quad \text{in the interval } [1,4].$$
(b) Prove that a tree with n vertices have $n-1$ number of edges.
(c) State Rolle's theorem and give its geometrical representation.
(d) Find the forms of CNF and DNF which are logically equivalent to $\big((p \to q) \to r\big) \to s$.
(e) How many permutations are there of the letter 'MISSISSIPPI' ?

4. Answer the following questions (any three) 10x3=30

(a) (i) State and prove Lagrange's mean value theorem. 6

(ii) $Differentiate \quad y = e^{5x+10} - 2x^2 + 2$ 4

(b) (i) A graph G is a tree if and only if there is one and only one path between any two vertices. 5

(ii) Prove that if a graph has no odd cycles, then it is bipartite. 5

(c) (i) Find the number of sides of a polygon with 21 diagonals. 5

(ii) How many triangles and straight lines can be drawn from set of 15 points and 5 points are collinear. 5

(d) (i) Compute the truth table $p \wedge (q \leftrightarrow r)$. 2

(ii) Define predicates and quantifiers with example. 4

(iii) Symbolize the statement- "All men are Mortal". 2

(iv) Find the negation of the statement "It is raining and cold". 2

(e) Find the maximum area of a rectangle that can be inscribed in the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$. Assume that the sides of the rectangles are parallel to the axes. 10

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