(FOR THE CANDIDATES ADMITTED | 24UDA1A1

DURING THE ACADEMIC YEAR 20   ONLY)   REG.NO. : [   ]

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI
END-OF-SEMESTER EXAMINATIONS : NOVEMBER 2024

BSC CS WITH DA   **MAXIMUM MARKS: 75**

SEMESTER: I   **TIME : 3 HOURS**

PART-III
24UDA1A1-: MATHEMATICAL FOUNDATION FOR DATA SCIENCE

SECTION – A   (10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS.   (K1)

1. The formula $p \wedge (q \wedge r)$ is equivalent to which of the following?_____

(a) $(p \vee q) \wedge (p \vee r)$ (b) $p \wedge (q \vee r)$ (c) $(p \wedge q) \vee (p \wedge r)$ (d) $p \wedge q \wedge r$

2. What is the cartesian product of two sets A = {1,2} and B = {3,4}?_____

(a) {1,2,3,4}   (b) {1,3,2,4}

(c) {(1,3), (1,4), (2,3), (2,4)}   (d) {(3,1), (3,2), (4,1), (4,2)}

3. Which of the following functions is an onto (surjective) function?_____

(a) $f : \mathcal{R} \to \mathcal{R}$ defined by $f(x) = x^2$ (b) $f : \mathcal{R} \to \mathcal{R}$ defined by $f(x) = x^3$

(c) $f : \mathcal{R} \to \mathcal{R}$ defined by $f(x) = e^x$ (d) $f : \mathcal{R} \to \mathcal{R}$ defined by $f(x) = \sin(x)$

4. What is the degree of an isolated vertex in a graph?_____

(a) 0   (b) 1   (c) 2   (d) Undefined

5. How many pendant vertices does a tree with 10 vertices and 9 edges have at least?_____

(a) 2   (b) 1   (c) 3   (d) 4

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES   (K2)

6. Define Tautology.

7. What is Equivalence Relation?

8. What is the base step in Mathematical Induction?

9. Define a Subgraph.

10. What is a Spanning Tree of a Graph?

SECTION – B   (5 X 5 = 25 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.   (K3)

11.   a) Describe the rules for Well Formed Formulae.
(OR)
b) Obtain the Disjunctive Normal Form of P→ (P→Q) ∧ 7 (7Q ∨ 7P)**.**

12.   a) Let R = {(1, 2) (3, 4) (2, 2)} and S = {(4, 2) (2, 5) (3, 1) (1, 3)} find RoS, (SoR), Ro(SoR), (RoS) OR, (RoR), (SoS) OR RoRoR
(OR)

Ethical paper

b) Define an equivalence relation. Given a set A = {1,2,3} and a relation R = {(1,1), (2,2), (3,3), (1,2), (2,1)} check whether R is an equivalence relation. If not, find the symmetric and transitive closures.

13.   a) Explain the differences between one-to-one (injective) functions and onto (surjective) functions with suitable examples.
(OR)
b) Explain the technique of proof by contradiction with an example.

14.   a) Describe the differences between finite and infinite graphs with examples.

(OR)
b) Show that a connected graph G is Eulerian if and only if the degree of each vertex of G is even.

15.   a) What is tree in graph theory? Explain some fundamental properties of trees.
(OR)
b) Prove that a tree with n vertices has exactly n-1 edges**.**

SECTION – C   (5 X 8 = 40 MARKS)
ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.(K4 (Or) K5)

16.   a) Construct the truth table for:
(i) $(Q \wedge (P \to Q)) \to P$ (ii) $7(P \vee (Q \wedge R)) \leftrightarrow ((P \vee Q) \wedge (P \vee R))$
(OR)
b) Find the Conjunctive Normal Forms for the following:
(i) $7(P \vee Q) \leftrightarrow (P \wedge Q)$ (ii) $Q \vee (P \wedge 7Q) \vee (7P \wedge 7Q)$

17.   a) What is a relation? Discuss the different ways of representing a relation with examples. Also explain its properties.
(OR)
b) Describe the Closures and Warshall's algorithm.

18.   a) Discuss the concept of invertible functions. Provide conditions under which a function is invertible and give an example of an invertible function.
(OR)
b) Discuss the principle of mathematical induction and its importance in proving statements about natural numbers. Provide an example where induction is applied.

19.   a) Explain the concepts of isolated vertex and pendant vertex in graph theory.

(OR)
b) If G is a simple graph with n (≥3) vertices, and if deg(v) + deg(w) ≥ n for each pair of non-adjacent vertices v and w, then G is Hamiltonian.

20.   a) Explain vertices and leafs in trees. Also prove that binary tree with n internal vertices has n+1 Leaves**.**
(OR)
b) What are rooted and binary trees? Explain their structure and properties.

Ethical paper   ***********************