

(FOR THE CANDIDATES ADMITTED

24UAI3A1

DURING THE ACADEMIC YEAR 2024

ONLY)

REG.NO. :

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI

END-OF-SEMESTER EXAMINATIONS : NOVEMBER-2025

BSC COMP.SCIENCE WITH AI & ML

MAXIMUM MARKS: 75

SEMESTER-III

TIME : 3 HOURS

PART - III

24UAI3A1– DISCRETE STRUCTURES AND ITS APPLICATIONS

SECTION – A

(10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS.

(K1)

1. Which of the following connectives forms a functionally complete set?
a) {AND, OR} b) {NAND} c) {OR, NOT} d) {XOR, AND}
2. If $A = \{1, 2\}$ and $B = \{x, y, z\}$ then $A \times B$ contains how many ordered pairs?
a) 2 b) 3 c) 5 d) 6
3. If $f: A \rightarrow B$ is one-to-one and $|A| = 4$, then the maximum possible value of $|B|$ is: _____
a) 1 b) 4 c) ≥ 4 d) ≤ 4
4. In a simple graph, the sum of the degrees of all vertices is equal to: _____
a) The number of vertices b) Twice the number of edges
c) The number of edges d) The square of the number of vertices
5. A tree with n vertices always has _____
a) n edges b) $n - 1$ edges c) $n + 1$ edges d) $2n - 1$ edges

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES

(K2)

6. State any two functionally complete sets of connectives
7. Write any two operations that can be performed on relations.
8. Write the two main steps involved in the mathematical induction proof method.
9. Define a pendant vertex.
10. Define a rooted tree?

SECTION – B

(5 X 5 = 25 MARKS)

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

11. a) Define a well-formed formula (WFF) with two examples.
(OR)
b) Explain the Duality Law in propositional logic with an example
12. a) Explain the properties of Equivalence Relations with examples.
(OR)
b) Discuss the concept of Partitions of a set and show how they are related to equivalence classes

(CONT...2)

13. a) Show that the composition of two one-to-one functions is also one-to-one.
(OR)
b). Prove by mathematical induction: $1+3+5+\dots+(2n-1)=n^2$
14. a) Draw a null graph with 5 vertices and list its properties
(OR)
b) State the conditions for the existence of an Euler circuit and Euler path
15. a) Prove that a tree with n vertices has exactly $n-1$ edges.
(OR)
b) Differentiate between rooted trees and binary trees with suitable diagrams.

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

16. a) Explain the different types of logical connectives with their truth tables and examples
(OR)
b) Show that $(p \vee q) \Rightarrow (q \vee p)$ is a tautology using a truth table.
17. a) Explain the operations on relations with examples.
(OR)
b) Describe Warshall's algorithm for finding the transitive closure of a relation, and illustrate it with an example.
18. a) Find the inverse of the function $f(x)=3x+2$ and verify it
(OR)
b) Explain special types of functions with examples and graphs.
19. a) Explain the difference between finite and infinite graphs, and discuss isolated vertices, pendant vertices, and null graphs with diagrams.
(OR)
b) Describe the Travelling Salesman Problem (TSP). Formulate it as a weighted graph problem and explain one method to solve it.
20. a) List the different properties of trees in graph theory with proofs.
(OR)
b) Explain the various methods to find spanning trees with examples.

Ethical paper