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| 4BITSA1 |

**U.G. DEGREE EXAMINATION, APRIL 2021 &**

**Supplementary / Improvement / Arrear Examinations**

**Information Technology**

**Allied : DISCRETE MATHEMATICS**

**(CBCS – 2014 onwards)**

Time : 3 Hours　　　　　　　　　　Maximum : 75 Marks

**Part A**　　　　　　$(10 \times 2 = 20)$

Answer **all** questions.

1. Define: Proposition.

2. Write the following statement in symbolic form:

   If it is raining, then we will not meet today.

3. Define: (a) Elementary product (b) Elementary sum.

4. What is Universal quantifier?

5. Define: Null Graph. Give an example.

6. What is simple digraph?

7. Draw all trees with four vertices.

8. What is cut-set?

9. Find all partitions of the set $A = \{a, b, c\}$.

10. What is partial ordering?

**Part B** $(5 \times 5 = 25)$

Answer **all** questions, choosing either (a) or (b).

11. (a) Define: Conditional statement and draw its truth table.

Or

(b) What is well-formed formula? Give examples.

12. (a) Obtain a conjunctive normal form of

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

Or

(b) Verify the validity of the following argument:

Lions are dangerous animals. There are lions. Therefore there are dangerous animals.

13. (a) Define Tournament graph and give an example of tournament with six vertices.

Or

(b) Prove that, in any graph, the number of vertices of odd degree is even number.

14. (a) Show that a connected graph with n vertices and $n$-1 edges is a tree.

Or

(b) Write the Kruskal's algorithm to find the minimum spanning tree.

15. (a) Prove that the relation "congruence module m" over the set of positive integers is an equivalence relation.

Or

(b) Show that every chain is a distributive lattice.

**Part C** (3 × 10 = 30)

Answer any **three** questions.

16. Construct the truth table of the following formulas:

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

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

17. Obtain the principal conjunctive normal form of the formula

$(\neg P \to R) \wedge (Q \rightleftarrows P)$

18. Prove that a simple graph with n vertices and k components can have at most $(n-k)(n-k+1)/2$ edges.

19. Explain the Dijkstra' s algorithm to find the shortest path problem.

20. In a Boolean algebra, show that

(a) $a \vee (a' \wedge b) = a \vee b$

(b) $a \wedge (a' \vee b) = a \wedge b$.