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(FOR THE CANDIDATES ADMITTED

SUB CODE

DURING THE ACADEMIC YEAR 2023 ONLY)

REG.NO. :

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

END-OF-SEMESTER EXAMINATIONS : MAY 2024

B.Sc.(IT)

MAXIMUM MARKS: 75

SEMESTER: II

TIME : 3 HOURS

PART - III

Allied-II MATHAMETICS II- DISCRETE MATHEMATICS

SECTION - A

(10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS.(K1)

- For any two sets A and B, $A \cap (A \cup B) =$ _____
(a) A (b) B (c) ϕ (d) $A \cap B^c$
- The conjunction of two statements p and q is denoted by _____
(a) $p \wedge q$ (b) $p \vee q$ (c) $P \rightarrow q$ (d) $P \leftrightarrow q$
- If R and S are two relations from A to B , then $(R \cup S)^{-1} =$ _____
(a) $R \cap S$ (b) $(R \cap S)^{-1}$ (c) $R^{-1} \cap S^{-1}$ (d) $R^{-1} \cup S^{-1}$
- In a graph $G (V, E)$, degree of vertex one is called _____
(a) Isolated vertex (b)Pendant vertex
(c) Cut vertex (d) Pseudo vertex
- The length of a string u is denoted by
(a) u^* (b) u^+ (c) $|u|$ (d) \sum^u

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES

(K2)

- Define : Disjoint set
- Explain : Tautology

8. Define : Universal Relation
9. Explain : Degree of a vertex
10. Define Relatively Prime Integer .

SECTION – B

(5 X 5 = 25 MARKS)

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

11. (a) If $A = \{ 3, 4, 2 \}$, $B = \{ 3, 4, 5, 6 \}$ and $C = \{ 2, 4, 6, 8 \}$ prove that

$$A \cap (B - C) = (A \cap B) - (A \cap C)$$

(or)

- (b) If A and B are any two sets , then prove that $(A - B) \cap (A \cap B) = \phi$

12. (a) Prove that $\sim p \vee \sim q = \sim (p \wedge q)$

(or)

- (b) If p , q and r are three logical statements , then show that

$$[(p \Rightarrow q) \wedge (q \Rightarrow r)] \Rightarrow (p \Rightarrow r)$$

13. (a) Show that the relation \leq (less than or equal to) defined on the set of positive Integers I^+ is a partial order relation.

(or)

- (b) If R and S are relations from A to B prove that $(R \cap S)^{-1} = R^{-1} \cap S^{-1}$.

14. (a) Define path , cycles and connectivity of a graph with examples .

(or)

- (b) Prove that every tree with n vertices has n-1 edges.

15. (a) Let $L_1 = \{ a, ab, a^2 \}$ and $L_2 = \{ b^2, aba \}$ be two languages over the alphabet

$$\Sigma \{ a, b \} , \text{ then find } L_1 L_2, L_2 L_1, L_2^2.$$

(or)

- (b) Explain the different types of grammars.

SECTION - C

(5 X 8 = 40 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. (K4 /K5)

16. (a) If A and B are any two sets, then

$$(a) A \cap (B-A) = \emptyset \quad (b) (A-B) \cap B = \emptyset$$

(or)

(b) A TV survey shows that 60 percent people see program A, 50 percent see Program B, 50 percent see program C, 30 percent see program A and B, 20 percent see program B and C, 30 percent see program A and C, and 10 Percent do not see any program. Find (i) What percent see program A, B and C? (ii) What percent see exactly two programs? (iii) What percent see Program A alone?

17. (a) (i) Show that the statement $(p \wedge q) \Leftrightarrow (p \vee q)$ is a tautology.

(ii) Show that $(p \wedge q) \wedge \sim (p \vee q)$ is a fallacy.

(or)

(b) Prove that $p \Leftrightarrow (q \wedge r) \equiv (p \Leftrightarrow q) \wedge (p \Leftrightarrow r)$.

18. (a) Let N be the set of all natural numbers. The relation R on the set $N \times N$ of Ordered pairs of natural numbers is defined as $(a, b) R (c, d)$ if and only if $a + d = b + c$. Prove that R is an equivalence relation.

(or)

(b) If R and S are equivalence relation on a set A, prove that $R \cap S$ is an equivalence relation in A.

19. (a) Prove that the maximum number of vertices possible in a binary tree of height n

$$\text{is } 2^n - 1; n \geq 1.$$

(or)

(b) Draw the expression tree for the following expression and write the prefix and Postfix form of the expression.

$$(a+5)*\{[(7*b)+c]\}(9+d).$$

20. (a) Show that $\sqrt{5}$ is not a rational number.

(or)

(b) Find the phrase structure grammar that generates the language $L = \{ a^n b^{2n} : n \geq 1 \}$.

