Reg. No. : | | | | | | | | | | |

Question Paper Code: 54001

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2017

Fourth Semester

Computer Science and Engineering

15UMA421 - DISCRETE MATHEMATICS

(Common to Information Technology)

(Regulation 2015)

Duration: Three hours | Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Symbolise the following statement "x^2 is non-negative", assuming the real numbers as the universe of discourse

   (a) $(\exists x)(x^2 \geq 0)$ (b) $(\exists x)(x^2 < 0)$
   (c) $(\forall x)(x^2 \geq 0)$ (d) $(\forall x)(x^2 < 0)$

2. The contra positive of the conditional statement $P \to Q$ is given by

   (a) $\neg Q \to \neg P$ (b) $\neg P \to \neg Q$
   (c) $\neg(Q \to P)$ (d) $\neg(P \to Q)$

3. The number of possible solutions of the equation $x + y + z = 15$ for $x, y, z \geq 0$ is

   (a) C(15, 3) (b) C(16, 3) (c) C(17, 2) (d) C(18, 2)

4. How many three letter words can be formed from the set $\{a, b, c, d\}$

   (a) 12 (b) 64 (c) 24 (d) 81

5. A graph in which every vertex has the same degree is called

   (a) Simple graph (b) Regular graph (c) complete graph (d) Euler graph

6. For what values of 'n' the graph K_n is Hamiltonian

   (a) $n \geq 2$ (b) $n \geq 3$ (c) $n > 4$ (d) $n > 5$

7. The minimum order of non-abelian group is

(a) 4 (b) 8 (c) 5 (d) 6

8. Every cyclic group is

(a) non-abelian (b) abelian (c) symmetric (d) both (a) and(b)

9. In distributive complemented lattice $a \leq b$ if and only if

(a) $a = b$ (b) $a' \oplus b = 0$ (c) $a * b' = 1$ (d) $b' \leq a'$

10. The dual of $a \wedge \bar{a} = 0$ is

(a) $a \wedge \bar{a} = 1$ (b) $a \vee \bar{a} = 0$ (c) $\bar{a} \wedge a = 0$ (d) $a \vee \bar{a} = 1$

PART - B (5 x 2 = 10 Marks)

11. Symbolize the statement " All men are giants".

12. When is a recurrence relation said to be homogeneous?

13. State the hand shaking theorem.

14. Prove that the identity element is unique in a group.

15. Define poset . Give an example.

PART - C (5 x 16 = 80 Marks)

16. (a) Obtain the principal conjunctive and principal disjunctive normal form of $(\sim P \rightarrow r) \wedge (q \leftrightarrow p)$. (16)

Or

(b) By in direct method, prove that $(x)[P(x) \rightarrow Q(x)], (\exists x)xP(x) \Rightarrow (\exists x)Q(x)$. (16)

17. (a) Prove that by mathematical induction $\frac{1}{1.2}+\frac{1}{2.3}+\frac{1}{3.4}+..+\frac{1}{n(n+1)}=\frac{n}{n+1}$. (16)

Or

(b) If we select 10 points in the interior of an equilateral triangle of side 1, show that there must be atleast two points whose distance apart is less than 1/3. (16)

18. (a) Construct circuit matrix, incidence matrix and path matrix p (v_2, v_4). (16)

Or

(b) Prove that G is a tree if and only if there is only one path between every pair of vertices. (16)

19. (a) (i) Prove that (Z_5, X_5) is an abelian group. (8)

(ii) Prove that a finite integral domain in a field. (8)

Or

(b) (i) Prove that every subgroup of an abelian group is normal. (8)

(ii) Find the left cosets of {[0], [2]} in the group (Z_4 , $+_4$). (8)

20. (a) (i) State and prove the distributive inequalities in a lattice. (8)

(ii) Define Boolean algebra and give an example. (8)

Or

(b) If $(L, \wedge, \vee)$ be a complemented, distributive lattice, then for any a, b ∈ L prove that (i) $\overline{a \vee b} = \bar{a} \wedge \bar{b}$ (ii) $\overline{a \wedge b} = \bar{a} \vee \bar{b}$. (16)