A **Reg. No. :** | | | | | | | | | | |

Question Paper Code: 54021

B.E./B.Tech. DEGREE EXAMINATION, MAY 2018

Fourth Semester

Computer Science and Engineering

15UMA421 - DISCRETE MATHEMATICS

(Common to Information Technology)

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

PART A - (10 x 1 = 10 Marks)

1. Symbolic form the statement "good food is not cheap" is CO1-U

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

2. The inverse of $Q \rightarrow P$ is CO1- U

   (a) $\neg P \rightarrow \neg Q$ (b) $P \rightarrow Q$ (c) $\neg Q \rightarrow \neg P$ (d) none of these

3. The coefficient of $x^{10}y^{15}$ in the expansion of $(x + y)^{25}$ is CO2- E

   (a) C (25, 15) (b) C (25, 10) (c) C (25, 5) (d) C (15, 10)

4. In how many ways can 9 people be seated in a circle? CO2- U

   (a) 6! (b) 9! (c) 10! (d) 8!

5. The complement of the graph K_n is a CO3- E

   (a) null graph having n vertices (b) regular graph having n Vertices

   (c) regular graph having $n-1$ vertices (d) none of these

6. If a graph has 15 edges, what must the degrees of the vertices add up to? CO3- E

(a) 25 (b) 15 (c) 30 (d) 45

7. The intersection of two normal subgroups of a group is a CO4- R

(a) normal subgroup (b) group (c) subgroup (d) none of these

8. (N, +) is a CO4- R

(a) normal group (b) monoid (c) group (d) semigroup

9. The distributive inequalities of a lattice is CO5- R

(a) $a \wedge (b \vee c) \leq (a \wedge b) \vee (a \wedge c)$ (b) $a \wedge (b \vee c) > (a \wedge b) \vee (a \wedge c)$

(c) $a \wedge (b \vee c) \geq (a \wedge b) \vee (a \wedge c)$ (d) $a \wedge (b \vee c) < (a \wedge b) \vee (a \wedge c)$

10. $x \wedge x'$ is equivalent to CO5- R

(a) x' (b) x (c) 0 (d) 1

PART – B (5 x 2= 10Marks)

11. Obtain the DNF of P ∧ (P → Q. CO1-E

12. State Pigeonhole principle. CO2- R

13. Give an example of a graph which is both an Eulerian and a Hamiltonian circuit. CO3- Ana

14. Define field and give an example. CO4- R

15. In any Boolean algebra, show that $(a + b)(a' + c) = a'b + ac + bc$ CO5- R

PART – C (5 x 16= 80Marks)

16. (a) (i) Test the validity of the following arguments. CO1- App (8)

(a) If A works hard, then either B or C will enjoy themselves.

(b) If B enjoys himself, then A will not work hard.

(c) If D enjoys himself, then C will not enjoy himself.

(d) Therefore, if A works hard then D will not enjoy himself.

(ii) Show that $(\forall x)(P(x) \rightarrow Q(x)), \forall x(Q(x) \rightarrow R(x)) \Rightarrow \forall x(P(x) \rightarrow R(x))$. CO1- App (8)

Or

(b) (i) Obtain PDNF and PCNF of $(P \wedge Q) \vee (\neg P \wedge R)) \vee (Q \wedge R)$. CO1- App (8)

(ii) Show that the following argument is valid" Every micro computer has a serial interface port. Some micro computers have a parallel port. Therefore some micro computers have both serial and parallel port. CO1- App (8)

17. (a) (i) Prove by mathematical induction that CO2- E (8)

$$1^2 + 3^2 + 5^2 + \ldots + (2n-1)^2 = \frac{n(2n-1)(2n+1)}{3}.$$

(ii) Solve s(k) -5s(k-1) + 6s(k-1)=2, s(0)=1and s(1)=1 CO2- U (8)

Or

(b) (i) Using generating function solve the recurrence relation $y_{n+2} - 6y_{n+1} + 5y_n = 0$ with $y_0 = 2$, $y_1 = 6$. CO2- App (8)

(ii) Out of 100 sportsmen in a college 39 play tennis, 58 play cricket, 32 play hockey, 10 play cricket and hockey, 11 play hockey and tennis, 13 play tennis and cricket. How many play CO2- E (8)

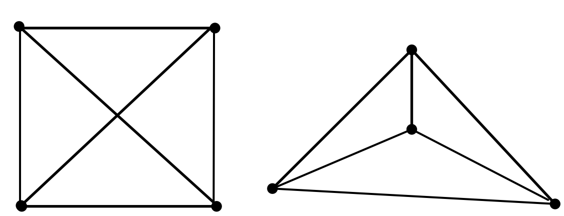
(1) All the three games.

(2) Just one game.

(3) Tennis and cricket but not hockey.

18. (a) (i) The maximum number of edges in a simple disconne graph G with n vertices and k components is $\frac{(n-k)(n-k+1)}{2}$. CO3- Ana (8)

(ii) Are the two graphs following isomorphic? Why? CO3- Ana (8)



Or

	(b)	(i) Prove that a simple graph with n vertices must be connected if it has more than $\frac{(n-1)(n-2)}{2}$ edges.	CO3- Ana	(8)
		(ii) Prove that a connected multigraph G has an Euler circuit if each of its vertices has an even degree.	CO3- Ana	(8)
19.	(a)	(i) Show that (G,*) is an abelian group if and only if $(a*b)^2 = a^2*b^2$ for all a,b ε G	CO4- Ana	(8)
		(ii) Show that (I,⊕,⊗) is a commutative ring with identity where operations ⊕,⊗ are defined by a⊕b=a+b-1 and a⊗b=a+b-ab, where I is the set of all integers.	CO4- Ana	(8)
		Or		
	(b)	(i) Prove that the order of a subgroup of a finite group divides the order of the group.	CO4- App	(8)
		(ii) Show that every finite integral domain is a field.	CO4- App	(8)
20.	(a)	(i) Let (L, ≤) be a lattice. Prove that (a) a∨b = b if and only if a ≤ b (b) a∧b = a if and only if a ≤ b for every a, b in L.	CO5- U	(8)
		(ii) Prove that every chain is a distributive lattice.	CO5- E	(8)
		Or		
	(b)	(i) In a Boolean algebra show that the following statements are equivalent. For any a and b , (a) $a + b = b$ (b) $a . b = a$ (c) $a' + b = 1$ (d) $a . b' = 0$ (e) $a \le b$.	CO5- E	(10)
		(ii) Show that in a Boolean algebra $a = b$ if and only if $a b' + a' b = 0$.	CO5- E	(6)