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

Question Paper Code: 54021

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

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. If 'k' Pigeon occupies 'n'(m>n) holes then atleast one hole has more than ---- Pigeons CO1-U

   (a) $\left[\frac{n-1}{k}\right]$ (b) $\left[\frac{k-1}{n}\right]$ (c) $\left[\frac{k-1}{n}\right]+1$ (d) $\left[\frac{n-1}{k}\right]+1$

2. We need quantifiers to formally express the meaning of the words CO1- U

   (a) And and Or (b) If …then (c) If and only if (d) All and some

3. The number of possible solutions of the equation $x+y+z=15$ for $x,y,z\geq 0$ is CO2- E

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

4. __________ ways are there to select a first-prize winner, a second-prize winner and a third-prize winner from 100 different people. CO2- U

   (a) 100 (b) 100 x 99 (c) 100 x 99 x 98 (d) 100 + 99 + 98

5. A graph in which every vertex has the same degree is called CO3- E

   (a) Simple graph (b) Regular graph

   (c) Complete graph (d) Euler graph

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. ($(N, \square)$ is a CO4- R

(a) Abelian group (b) group (c) monoid (d) semogroup

9. In distributive complemented lattice $a \le b$ if and only if CO5- R

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

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

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

PART – B (5 x 2= 10Marks)

11. Differentiate predicate and predicate logic? 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. Prove that the identity element is unique in a group. CO4- R

15. Define poset . Give an example. CO5- R

PART – C (5 x 16= 80Marks)

16. (a) Obtain the principal conjunctive and principal disjunctive normal form of $(\sim P \to r) \wedge (q \leftrightarrow p)$. CO1- App (16)

Or

(b) (i) Show that (x) (P(x) $\vee$ Q(x)) $\Rightarrow$(x) P (x) $\vee$ $(\exists x)$Q (x). CO1- App (6)

(ii) Prove that the premises "one student in this class knows how to write programs in JAVA" and "Everyone who knows how to write programs in JAVA can get a high-paying job " imply the conclusion "Some in this class can get a high-paying job". CO1- App (10)

17. (a) (i) Prove that by mathematical induction CO2- E (12)

$$\frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + .. + \frac{1}{n(n+1)} = \frac{n}{n+1}.$$

(ii) Solve s(k) -5s(k-1) + 6s(k-1)=2, s(0)=1and s(1)=1 CO2- U (4)

Or

	(b)	Use the method of generating function to solve the recurrence relation $$a_{n+1} - 8a_n + 16a_{n-1} = 4^n;\ n \geq 1;\ a_0 = 1,\ a_1 = 8.$$	CO2- App	(16)
18.	(a)	Construct circuit matrix, incidence matrix and path matri (v_2, v_4).	CO3- Ana	(8)
		Or		
	(b)	(i) Prove that the maximum number of edges in a simple disconnected graph G with n vertices and k components is $\frac{(n-k)(n-k+1)}{2}$	CO3- Ana	(8)
		(ii) Prove that a tree with n vertices has n-1 edges.	CO3- Ana	(8)
19.	(a)	(i) State and prove Lagrange's theorem.	CO4- Ana	(8)
		(ii) The necessary and sufficient condition that a non empty subset of a group G be a Subgroup is $a \varepsilon H, b \varepsilon H \Rightarrow a * b^{-1} \varepsilon H$	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) State and prove the distributive inequalities in a lattice.	CO5- U	(8)
		(ii) Show 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) $a \leq b$.	CO5- E	(10)
		(ii) Prove that algebraically (a) $a\overline{b}+b\overline{c}+c\overline{a}=\overline{a}b+\overline{b}c+\overline{c}a$ (b) $(a+b')(b+c')(c+a')=(a'+b)(b'+c)(c'+a)$	CO5- E	(6)