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

Question Paper Code: 54021

B.E./B.Tech. DEGREE EXAMINATION, MAY 2022

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. Sentences which are exclamatory, interrogative or imperative in nature are CO1-U

   (a) Propositions (b) Not propositions (c) Predicate (d) Not predicate

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. If there are 32 microcomputers in a computer center, and if each microcomputer has 24 ports, then there will be _____ different ports to a microcomputers in the center. CO2-U

   (a) 32 (b) 32 x 24 (c) 24 (d) 32+24

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 is a collection of CO3- E

   (a) Rows and columns (b) Equations

   (c) Vertices and edges (d) Tree

6. If the sub graph T of a connected graph G is a tree containing all the vertices of G, then T is called a _____ tree. CO3- E

(a) Binary (b) Spanning (c) Rooted (d) Component

7. An algebraic system $(R, +, \bullet)$ is a ring if CO4- R

(a) (R,+) is an abelian group (b) $(R, \bullet)$ is a semi group

(c) (R,+) is homomorphic (d) Both (i) & (ii)

8. Every finite integral domain is a CO4- R

(a) Monoid (b) Coset (c) Ring (d) Field

9. A set together with a partial order relation is called CO5- R

(a) Set (b) Subset (c) Poset (d) Coset

10. For any a, b ε G (group), then $(a * b)^{-1} =$ CO5- R

(a) a * b (b) $a^{-1} * b^{-1}$ (c) $b^{-1} * a^{-1}$ (d) b * a

PART – B (5 x 2= 10Marks)

11. Differentiate predicate and predicate logic? CO1-E

12. State Pigeonhole principle. CO2- R

13. Define graph isomorphism. CO3- Ana

14. List any two properties of a group. CO4- R

15. Let X = {2, 3, 6, 12, 24, 36 } and the relation $\leq$ be such that x $\leq$ y if x divides y. Draw the Hasse diagram of $(X, \leq)$ CO5- R

PART – C (5 x 16= 80Marks)

16. (a) (i) Prove that $p \rightarrow (q \rightarrow r) \Rightarrow (p \rightarrow q) \rightarrow (p \rightarrow r)$. CO1- App (6)

(ii) Show that the following premises are inconsistent. CO1- App (10)

(a) If Vijay misses many classes, then he fails in M.E.

(b) If Vijay fails in M.E., then he is unemployed.

(c) If Vijay appears for lot of interviews, then he is not unemployed.

(d) Vijay misses many classes and appears for lot of interviews.

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) There are 250 students in an engineering college. Of these 188 have taken a course in Fortran. 100 have taken a course in C and 35 have taken a course in JAVA. Further 88 have taken courses in both Fortran and C. 23 has taken courses in both C and JAVA and 29 have taken courses in both Fortran and JAVA. If 19 of these students have taken all the three courses, how many of these 250 students have not taken a course in any of these three programming languages? CO2- App (8)

(ii) Use mathematical induction to prove that $n^3 + 2n$ is divisible by 3, for $n \geq 1$. CO2- App (8)

Or

(b) Use the method of generating function to solve the recurrence relation CO2- App (16)

$$a_{n+1} - 8a_n + 16a_{n-1} = 4^n;\ n \geq 1;\ a_0 = 1,\ a_1 = 8.$$

18. (a) (i) Show that the number of vertices of odd degree in an undirected graph is even. CO3- App (6)

(ii) Give an example of a graph which contains CO3- App (10)

(a) an Eulerian circuit that is also a Hamiltonian circuit.
(b) an Eulerian circuit and a Hamiltonian circuited that are distinct.
(c) an Eulerian circuit, but not a Hamiltonian circuit.
(d) a Hamiltonian circuit, but not an Eulerian circuit.
(e) neither an Eulerian circuit nor a Hamiltonian circuit.

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) 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) Prove that the intersection of two subgroup of a group G is also a subgroup of G.	CO4- Ana	(8)
		Or		
	(b)	(i) Prove that the set of inverses of the elements of a right coset is a left coset	CO4- App	(8)
		(ii) Show that if G is a finite group, then O(H) | O(G), for all sub-group H of G.	CO4- App	(8)
20.	(a)	(i) Show that every chain is a distributive lattice.	CO5-App	(8)
		(ii) In a distributive lattice, show that $(a*b)\oplus(b*c)\oplus(c*a) = (a\oplus b)*(b\oplus c)*(c\oplus a)$	CO5-App	(8)
		Or		
	(b)	(i) In any Boolean algebra, show that $a\,b' + a'\,b = 0$ if and only if a = b.	CO5- App	(8)
		(ii) Show that b = a', if a + b = 1 and a . b =0, in Boolean algebra.	CO5- App	(8)