Reg. No.												

Question Paper Code	12540

B.E. / B.Tech. / M.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2023

Second Semester

Computer Science and Engineering

(Common to Information Technology, Computer Science and Engineering (AIML), Computer Science and Engineering (IOT), Artificial Intelligence and Data Science, M.Tech. Computer Science and Engineering & Computer Science and Engineering (Cyber Security))

20BSMA204 - DISCRETE STRUCTURES

(Regulations 2020)

Duration: 3 Hours | Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks, K-Level, CO
1.	Let f, g: $R \to R$ defined by $(x) = 2x + 5$ and $(x) = x - 5$ ∀ x ∈ R. Find $f \circ g$ and $g \circ f$.	*2,K2,CO1*
2.	What is partial order relation?	*2,K1,CO1*
3.	Show that if seven colours are used to paint 50 bicycles, at least 8 bicycles will be of the same colour.	*2,K2,CO2*
4.	State Pigeon Hole Principle.	*2,K1,CO2*
5.	Show that $(p \wedge q) \to (p \vee q)$ is a tautology.	*2,K2,CO3*
6.	Find the contrapositive of the conditional statement 'The home team wins whenever it is raining'.	*2,K1,CO3*
7.	Define cyclic group.	*2,K1,CO4*
8.	Define Ring.	*2,K1,CO4*
9.	State Hand shaking theorem.	*2,K1,CO5*
10.	Define tree.	*2,K1,CO5*

PART - B (5 × 16= 80 Marks)

Answer ALL Questions

11.	a)	(i) Examine whether M is an equivalence relation or not where M isthe relation on the set of integers Z defined as follows: For $a, b \in Z$, aMb if and only if a is a multiple of b.	*8,K3,CO1*
		(ii) Let $f: Z \to Z$ be a function defined by $(x) = 2x^2 + 7x$. Test f is one-one and onto.	*8,K3,CO1*
		OR	
	b)	(i) Let $f(x) = 2x + 3$ and $g(x) = x^2 + 4$, $h(x) = x + 2$, find $(f \circ g) \circ h$ and $f \circ (g \circ h)$.	*8,K3,CO1*
		(ii) Examine whether the function $f: R \to R$ defined by $(x) = ax + b$ is invertible. If so find the inverse and $f^{-1}(\{1\})$.	*8,K3,CO1*

12. a) (i) Prove that $8^n - 3^n$ is a multiple of 5 by using method ofinduction. 8,K3,CO2

(ii) Find the number of integers between 1 to 100 that are not divisible by any of the integer 2, 3, 5 and 7. 8,K3,CO2

OR

b) (i) There are six men and five women in a room. Find the numberof ways four persons can be drawn from the room if (1) they can be male or female, (2) two must be men and two women, (3)they must all are of the same sex. 8,K3,CO2

(ii) How many positive integers less than 10,00,000 have the sum of their digits equal to 19? 8,K3,CO2

13. a) (i) Obtain the PCNF of $(\neg P \rightarrow R) \wedge (Q \leftrightarrow P)$ and hence find its PDNF. 8,K3,CO3

(ii) Using indirect method of proof, derive $P \rightarrow \neg S$ from $P \rightarrow (Q \vee R), Q \rightarrow \neg P, S \rightarrow \neg R, P$. 8,K3,CO3

OR

b) (i) Every living thing is a plant or an animal John's gold fish is alive and it is not a plant. All animals have hearts. Therefore,John's gold fish has a heart. 8,K3,CO3

(ii) Using Rule CP, obtain the following implication. 8,K3,CO3

$(\forall x)(P(x) \rightarrow Q(x)), (\forall x)(R(x) \rightarrow \neg Q(x)),$

$\Rightarrow (\forall x)(R(x) \rightarrow \neg P(x))$

14. a) State and prove Lagrange's theorem on finite Group. 16,K3,CO4

OR

b) (i) In a Boolean algebra show that that $a.b' + a'.b = 0$ if andonly if $a = b$. 8,K3,CO4

(ii) In any Boolean algebra, prove that the following statements are equivalent 8,K3,CO4

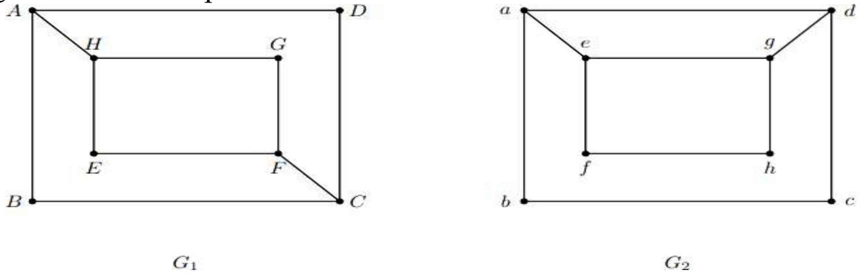
$a + b = b,$

$a.b = a,$

$a' + b = 1,$

$a.b' = 0$

15. a) (i) Examine whether the following pairs of graphs $G_1$and G_2 given in figures are isomorphic or not. 8,K3,CO5



(ii) Give an example of a graph which is *8,K3,CO5*

(1) Eulerian but not Hamiltonian
(2) Hamiltonian but not Eulerian
(3) Hamiltonian and Eulerian
(4) Neither Hamiltonian nor Eulerian.

OR

b) Prove that a connected graph G is Euler graph if and only if every vertexof G is of even degree. *16,K3,CO5*