QP Code:RJ23MCA009 Reg. No | | | | | | | | | | | AY 23

GIET UNIVERSITY, GUNUPUR – 765022

M.C.A (First Semester) Regular Examinations, January – 2024

MCA23105 - Discrete Mathematics

Time: 3 hrs Maximum: 60 Marks

(The figures in the right hand margin indicate marks)

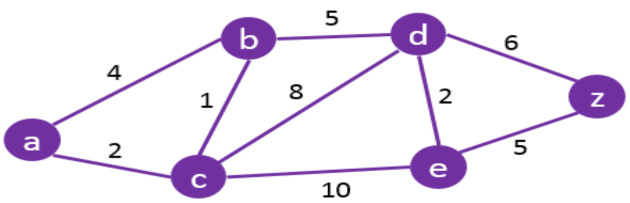
PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions		CO #	Blooms Level
a.	Define Tautology with suitable example.	CO2	K1
b.	What is Closure of relations?	CO1	K1
c.	Define a Monoid with suitable examples.	CO1	K1
d.	Define lattice with examples.	CO1	K1
e.	The planner representation of a simple graph with 4 vertices split the plane in to 2 regions then how many edges it has?	CO1	K1

PART – B **(10 x 5 = 50 Marks)**

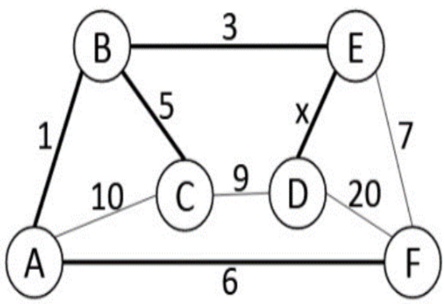
Answer ***ALL*** questions		Marks	CO #	Blooms Level
2. a.	Show the following equivalence $P \longrightarrow (Q \vee R) \Leftrightarrow (P \rightarrow Q) \vee (P \rightarrow R)$.	5	CO3	K3
b.	Show that $S \vee R$ is a tautologically implied by $(P \vee Q) \wedge (P \rightarrow R) \wedge (Q \rightarrow S)$.	5	CO3	K3
	(OR)			
c.	Show the following implication $((P \vee \neg P) \rightarrow Q) \rightarrow ((P \vee \neg P) \rightarrow R) \Rightarrow (Q \longrightarrow R)$.	5	CO3	K3
d.	Proved that $\sum_{n=1}^{N} n^3 = \left(\frac{N(N+1)}{2}\right)^2$ by method of induction.	5	CO2	K3
3.a.	What is the solution of the recurrence relation $a_n = a_{n-1} + 2a_{n-2}$ with $a_0 = 2$ and $a_1 = 7$?	5	CO3	K3
b.	Suppose that there are 1807 freshmen at your school. Of these, 453 are taking a course in computer science, 567 are taking a course in mathematics, and 299 are taking course in both computer science and mathematics. How many are not taking a course either in computer science or in mathematics?	5	CO2	K2
	(OR)			
c.	Find the transitive closure of the relation R = {(a, b), (b, c), (c, a), (c, b)} defined on the set A = {a, b, c}.using Wars hall's algorithm.	5	CO3	K2
d.	Draw the Hasse diagram of the POSET (p{a, b, c},$\subseteq$) . Where p{a, b, c} is the	5	CO3	K3

	power set of {a, b, c}.And also find the least and greatest elements of it.			
4.a.	If D30 is the set of positive divisors of 30. Is it a Boolean lattice under the relation a divides? Justify your answer.	5	CO3	K3
b.	In any Boolean algebra, show that $a = b \Leftrightarrow (a \star \bar{b}) \oplus (\bar{a} \star b) = 0$.	5	CO3	K4
	(OR)			
c.	Let $E(x_1, x_2, x_3, x_4) = (x_1 \star x_2) \oplus (x_1 * x_3) \oplus (\bar{x}_2 * x_3)$ be a Boolean expression. Find its disjunctive and conjunctive normal forms.	5	CO3	K4
d.	In any Boolean algebra, show that $(a \leq b) \Longrightarrow a \oplus (b \star c) = b \star (a + c)$.	5	CO3	K2
5.a.	If G ={1,–1, i, – i} and H ={1,–1}be a sub-group of G under the operation multiplication then find all the left cosets of H in G.	5	CO3	K3
b.	Is Z_4 a group under additive binary operations? If yes, find the order and all subgroup of Z_4.	5	CO2	K3
	(OR)			
c.	Verify the set of rational numbers excluding zero is an Abelian group under multiplication.	5	CO3	K4
d.	Define homomorphism between two groups with suitable examples.	5	CO2	K3
6.a.	Write the three differences between path and walk.	5	CO2	K3
b.	Use Kruskal's algorithm to find the minimum cost spanning tree.	5	CO3	K4



(OR)

c.	Define Hamilton paths and give an example.	5	CO2	K3
d.	Find minimum spanning tree by prim's algorithm	5	CO3	K4



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