Reg. No										

AY 24

Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
(GIET University)

M.C.A. (First Semester - Regular) Examinations, January – 2025

MCA251006 – Discrete Mathematics

Time: 2 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

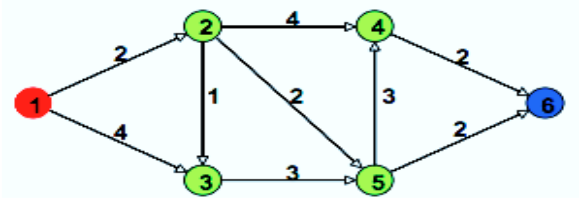
		CO #	Blooms Level
a.	Write the rule of inference "Modus Tollens"	CO1	K1
b.	Find out the generating function of $\frac{1}{(1-ax)^2}$	CO2	K2
c.	In a distributive lattice. if $b \wedge \bar{c} = 0$ *then show that* $b \leq c$	CO3	K2
d.	Define cyclic group and generator of cyclic group	CO4	K1
e.	Define Bi-partite graph and give an example	CO5	K1

PART – B **(10 x5=50 Marks)**

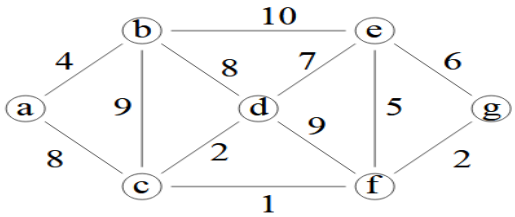
Answer ***ALL*** questions

		Marks	CO #	Blooms Level
2. a.	Show that $(p \rightarrow q) \wedge (q \rightarrow r) \rightarrow (p \rightarrow r)$ is a Tautology.	5	CO1	K2
b.	Prove by method of induction that, $(11)^{n+1} + (12)^{2n-1}$ is divisible by 133, for any integer 'n'	5	CO1	K2
	(OR)			
c.	Prove that $3 + 3.5 + 3.5^2 + \ldots\ldots + 3.5^n = \frac{3(5^{n+1}-1)}{4}$ whenever n is a non-negative integer by method of induction.	5	CO1	K2
d.	Prove that $\sqrt{2}$ is an irrational number by method of contradiction.	5	CO1	K2
3.a.	Use generating function to solve the recurrence relation $a_k = a_{k-1} + 2a_{k-2} + 2^k$ *with initial condition* $a_0 = 4$ *and* $a_1 = 12$	5	CO2	K2
b.	Use Warshall's algorithm to find the transitive closure of the relation R = {(b,c),(b,e),(c,e),(d,a),(e,b),(e,c) }defined on the set {a,b,c,d,e}.	5	CO2	K3
	(OR)			
c.	Find out the solution of the recurrence relation $a_n = 6a_{n-1} - 9a_{n-2}$ by using generating function.	5	CO2	K3
d.	Find the solution of the recurrence relation $a_n = -3a_{n-1} - 3a_{n-2} - a_{n-3}$ with initial conditions $a_0 = 1, a_1 = -2, a_2 = -1$	5	CO2	K3

4.a.	Let $E(x_1,x_2,x_3)=(x_1 \wedge x_2)\vee(x_1\wedge x_3)\vee(\bar{x}_2\wedge x_3)$ be a Boolean expression. Find its disjunctive and conjunctive normal forms	5	CO3	K2
b.	Let $(A,\leq)$ be a distributive lattice. show if $a\wedge x=a\wedge y$ and $a\vee x=a\vee y$ for some a then show that $x=y$	5	CO3	K3
	(OR)			
c.	Prove that in a distributive lattice if an element has a complement then this complement is unique.	10	CO3	K3
d	Let $E(x_1,x_2,x_3)=\overline{\overline{(x_1\vee x_2)}\vee(\overline{x_1}\wedge x_3)}$ be a Boolean expression. Find its disjunctive and conjunctive normal forms		CO3	K3
5.a.	State and prove Lagrange's theorem of finite groups.	5	CO4	K2
b.	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	CO4	K3
	(OR)			
c.	Prove that the identity element in a group is unique, give an example.	5	CO4	K3
d	Let a*H and b*H be two cosets of H in G. then Show that a*H and b*H are either identical or disjoint.	5	CO4	K3
6.a.	find the shortest path from the vertex 0 to the vertex 4 by using Dijkstra's algorithm	5	CO5	K2



b.	Prove the Euler's formula for the planner graph	5	CO5	K3
	(OR)			
c.	Find the minimum spanning tree of the following graph by using Prim's's algorithm.	5	CO5	K3



d.	Show that in an undirected Graph the odd degree vertices are even number.	5	CO5	K3

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