Reg. No | | | | | | | | | | |

AY 24

**GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY UNIVERSITY, ODISHA, GUNUPUR**

**(GIET UNIVERSITY)**

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

# MCA23105 – Discrete Mathematics

(MCA)

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

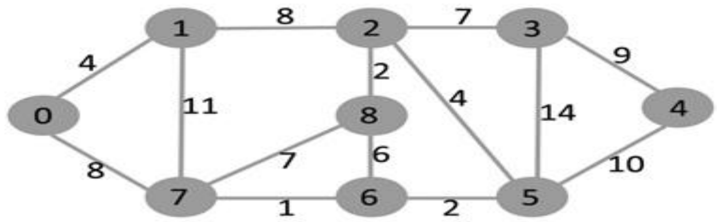
| | | CO # | Blooms Level |
|---|---|---|---|
| a. | Write the following statements in symbolic form of 'Mark is poor but happy'. | CO2 | K1 |
| b. | Define Reflexive relations. | CO1 | K1 |
| c. | State Lagrange's theorem of groups | CO1 | K1 |
| d. | Define complement of lattice. | CO1 | K1 |
| e. | Define isomorphic graph. | CO1 | K1 |

**PART – B** **(10 x 5 = 50 Marks)**

<u>Answer ***ALL*** questions</u>

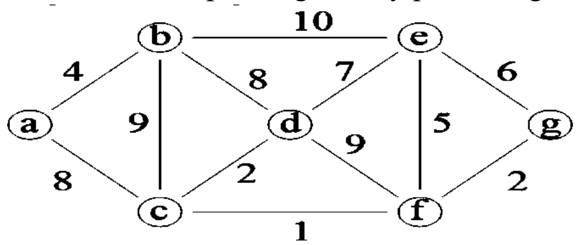
| | | Marks | CO # | Blooms Level |
|---|---|---|---|---|
| 2. a. | Show that $((P \vee Q) \wedge \neg(\neg P \wedge (\neg Q \vee \neg R))) \vee (\neg P \wedge \neg Q) \vee (\neg P \wedge \neg R)$ is a Tautology | 5 | CO3 | K3 |
| b. | Find (i) $\sum_{n=10}^{20} n^2$, (ii) $\sum_{n=5}^{25} n^3$ | 5 | CO3 | K3 |
| | (OR) | | | |
| c. | Draw the truth table for the following formula$(P \to Q) \to Q \Rightarrow P \vee Q$. | 5 | CO3 | K3 |
| d. | Prove by method of induction that $4^{n+1} + 5^{2n-1}$ is divisible by 21, for any integer 'n' | 5 | CO2 | K3 |
| 3.a. | Find the solution of the recurrence relation $a_n = 6a_{n-1} - 9a_{n-2} + 3^n$. | 5 | CO3 | K3 |
| b. | How many positive integers not exceeding 1000 are divisible by 7 or 11? | 5 | CO2 | K2 |
| | (OR) | | | |
| c. | Prove that congruent modulo of 'm' is an equivalence relations. | 5 | CO3 | K2 |
| d. | Let 'S' be a set. Determine greatest and least elements of the poset $(P(S), \subseteq)$ and draw the Hasse diagram. | 5 | CO3 | K3 |
| 4.a. | In any Boolean algebra, show that $(a \star b) \oplus (a \star \bar{b}) = b$. | 5 | CO3 | K3 |
| b. | Let $E(x_1, x_2, x_3, x_4) = \overline{(\overline{(x_1 \star x_2)} \oplus (\overline{x_1} \ast x_3))}$ be a Boolean expression. Find its disjunctive and conjunctive normal forms. | 5 | CO3 | K4 |
| | (OR) | | | |
| c. | In any Boolean algebra, show that $(a \leq b) \Rightarrow a \oplus (b \star c) = b \star (a + c)$. | 5 | CO3 | K4 |
| d. | Give an example a lattice which is not distributive. | 5 | CO3 | K2 |
| 5.a. | Show that $(Z_6, +_6)$ is a group where $Z_6 = \{0, 1, 2, 3, 4, 5\}$ and $+_6$ is congruent modulo 6. | 5 | CO3 | K3 |
| b. | Explain normal subgroup with a suitable example. | 5 | CO2 | K3 |
| | (OR) | | | |

| | | | | |
|---|---|---|---|---|
| c. | Define homomorphism of two groups. Let (S1, ∗1), (S2, ∗2) and (S3,∗3) be groups and f:S1→S2 and g:S2→S3 be homomorphism's. Prove that the mapping of g ◦ f : S1→S3 is a group homomorphism. | 5 | CO3 | K4 |
| d. | Verify the set of rational numbers excluding zero is an abelian group under multiplication. | 5 | CO2 | K3 |
| 6.a. | Define adjacency matrix. Explain with suitable examples. | 5 | CO2 | K3 |
| b. | Use Kruskal's algorithm to find the minimum cost spanning tree. | 5 | CO3 | K4 |




(OR)

| | | | | |
|---|---|---|---|---|
| c. | Define complete Bi-partite graph and draw K3,7. | 5 | CO2 | K3 |
| d. | Find minimum spanning tree by prim's algorithm | 5 | CO3 | K4 |

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