

--	--	--	--	--	--	--	--	--	--



GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Third Semester - Regular) Examinations, December – 2022

21BCSBS23001 – Discrete Mathematics

(CSE)

Time: 3 hrs

Maximum: 70 Marks

Answer ALL questions

(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 converse, inverse, contra positive of “If you work hard then you will be rewarded” | CO1 | K1 |
| b. Discuss the form does a particular solution of the liner homogeneous recurrence relation $a_n = 6a_{n-1} - 9a_{n-2} + n3^n$ have? | CO2 | K2 |
| c. State the necessary and sufficient condition for a non-empty subset H of a group G to be a subgroup of G. | CO2 | K3 |
| d. A simple graph G has 2 vertices of degree 2, 3 Vertices of degree 4 and 1 vertex of degree 4 then how many edges it has. | CO3 | K2 |
| e. Suppose that a connected planer graph has 30 edges. If a planer representation of this graph divide the plane into 20 regions, how many vertices does this graph have? | CO4 | K2 |

PART – B

(15 x 4 = 60 Marks)

Answer **ALL** the questions

- | | Marks | CO # | Blooms Level |
|---|-------|------|--------------|
| 2. a. Translate each of these statements into logic expressions using predicates, quantifiers and logical connectives | 8 | CO1 | K3 |
| i. No one is perfect. | | | |
| ii. Not everyone is perfect. | | | |
| iii. All your friends are perfect | | | |
| iv. At least one of your friends is perfect. | | | |
| v. Everyone is your friend and is perfect. | | | |
| vi. Not everybody is your friend or someone is not perfect. | | | |
| b. Verify the statements $(p \rightarrow q) \rightarrow (r \rightarrow s)$ and $(p \rightarrow r) \rightarrow (q \rightarrow s)$ are logically equivalent or not. | 7 | CO1 | K2 |
| (OR) | | | |
| c. Translate the following statements in to logical expressions using nested quantifiers. | 8 | CO1 | K2 |
| i. Sum of two positive integers is always positive. | | | |
| ii. Every real number except zero has a multiplicative inverse. | | | |
| iii. Everyone has exactly one best friend. | | | |
| iv. If a person is female and is a parent, then this person is someone’s mother. | | | |
| d. Prove by method of induction that sum of cubes of three consecutive positive integers are divisible by 9. | 7 | CO1 | K2 |
| 3.a. Find the solution of the recurrence relation $a_n = 4a_{n-1} - 3a_{n-2} + 2^n + n + 3$ with $a_0 = 1$ and $a_1 = 4$ | 8 | CO2 | K2 |

b. Use generating function to solve $a_n = 8a_{n-1} + 10^{n-1}$ with $a_1 = 9$ 7 CO2 K3

(OR)

c. Use Warshall's algorithm to find the transitive closure of the relation $R = \{(b,c), (b,e), (c,c), (d,a), (e,b), (e,c)\}$ on $A = \{a,b,c,d,e\}$ 8 CO2 K2

d. Construct the Hasse Diagram of the poset $(\{2,4,5,10,12,20,25\}, /)$ and also find 7 CO2 K2

- i. Maximal and Minimal elements.
- ii. l.u.b (4,5)
- iii. Greatest and least element if any.
- iv. Is it lattice? Justify!

4.a. 8 CO3 K3

- i. In a distributive lattice. if $b \wedge \bar{c} = 0$ then show that $b \leq c$.
- ii. Show that every distributive lattice is modular.

b. State and prove Lagrange's theorem of group theory. 7 CO3 K3

(OR)

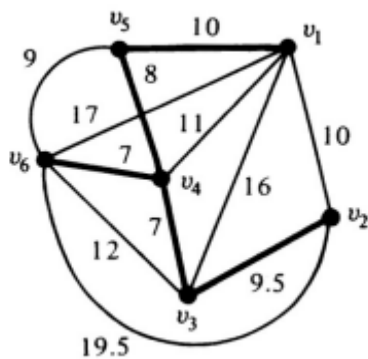
c. Find the disjunctive and conjunctive normal forms of the Boolean expression. 8 CO3 K3

$$E(x_1, x_2, x_3) = \overline{(x_1 \wedge x_2)} \vee \overline{(x_1 \vee x_3)}$$

d. Prove that the sub group of a cyclic group is cyclic. 7 CO3 K3

5.a. Prove that a tree with n vertices has n-1 edges. 8 CO4 K3

b. Construct the minimum spanning tree using Prim's algorithm. 7 CO4 K2



(OR)

c. State and prove Euler formula for planar graph. 8 CO4 K3

d. Construct the minimum spanning tree using Kruskal's algorithm. 7 CO4 K2



--- End of Paper ---