

**BACHELOR OF TECHNOLOGY (C.B.C.S.) (2020 COURSE)**

**B.Tech.Sem - III IT : : SUMMER - 2022**

**SUBJECT : DISCRETE STRUCTURES & GRAPH THEORY**

Day : Monday  
Date : 30-05-2022

**S-24706-2022**

Time : 02:30 PM-05:30 PM  
Max. Marks : 60

**N.B.:**

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Draw neat and labeled diagram **WHEREVER** necessary.
- 4) Assume suitable data if necessary.

- Q.1** a) Show that  $p \rightarrow (q \rightarrow r)$  and  $p \rightarrow (\sim q \vee r)$  is logically equivalent. [05]  
b) Without constructing truth table show that  $(p \wedge (p \rightarrow q)) \rightarrow q$ . [05]

**OR**

- Q.1** Let  $A = \{0, 2, 4, 6, 8, 10\}$  [10]  
 $B = \{0, 1, 2, 3, 4, 5, 6\}$   
 $C = \{4, 5, 6, 7, 8, 9, 10\}$  find:  
i)  $A \cap B \cap C$       iii)  $(A \cup B) \cap C$       v)  $A \cup (B \cup C)$   
ii)  $A \cup B \cup C$       iv)  $(A \cap B) \cup C$

- Q.2** Let  $A = \{1, 2, 3, 4\}$  and  $R = \{(1, 1), (1, 2), (2, 2), (2, 4), (1, 3), (3, 3), (3, 4), (1, 4)\}$  show that R is a partial order and draw Hasse diagram. Determine chains and anti-chains. [10]

**OR**

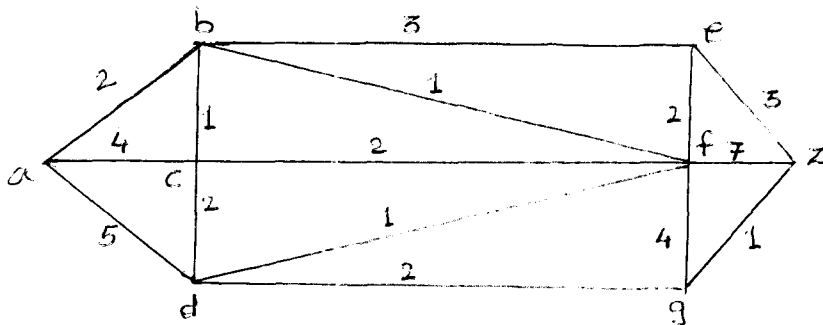
- Q.2** Given  $S = \{1, 2, 3, 4, 5\}$  and relation R on S, where  $R = \{(x, y) \mid x + y = 5\}$  [10]  
what are the properties of R. Check whether relation is partial order or equivalence. Justify your answer.

- Q.3**  $a_r = \begin{cases} 0 & 0 \leq r \leq 2 \\ 5^r & r \geq 3 \end{cases}$        $b_r = \begin{cases} 3+r & 0 \leq r \leq 1 \\ 2^r & r \geq 2 \end{cases}$  [10]  
Find  $C_r$  where  $C_r = a_r + b_r$  and  $d_r = a_r \cdot b_r$

**OR**

- Q.3** Explain following terms 'Transitive Closure'. Prove that if a relation R on a set A is transitive and irreflexive then it is asymmetric. [10]

- Q.4** Find shortest path between a to z for following graph using Dijkstra's algorithm. [10]



**OR**

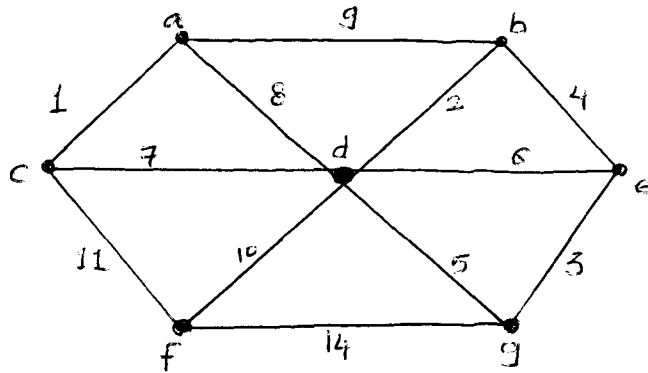
**P.T.O.**

**Q.4** Show that a complete graph  $k_n$  ( $n \geq 3$ ) has Hamiltonian circuit. What is the length of circuit? How many Hamiltonian circuit exists in  $k_n$ ? [10]

**Q.5** Construct a binary tree from given in order and preorder traversal: [10]  
 Inorder : AEBDCFGKIHJL  
 Preorder : FEADBCGHIJKL

**OR**

**Q.5** Find minimum spanning tree and weight of it for the given graph using Prim's algorithm. [10]



**Q.6** What is homomorphism in an algebraic system? What is monoid? Explain by giving example. [10]

**OR**

**Q.6** Explain following term with suitable example: [10]

- i) Ring
- ii) Integral Domain
- iii) Field

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