P P SAVANI UNIVERSITY

Second Semester of B.Sc. (IT) Examination

May 2022

SESH1061 Discrete Mathematics for Computer Applications

30.05.2022, Monday **Time: 10:00 a.m. To 12:30 p.m.** **Maximum Marks: 60**

Instructions:

1. The question paper comprises of two sections.
2. Section I and II must be attempted in same answer sheet.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

SECTION – I

Q - 1 **Define the following terms:** **[05]**

(i) Adjoint Matrix

(ii) Complete Lattice

(iii) Modular Lattice

(iv) Groupoid

(v) Group

From Q - 2 to Q - 8 attempt any Five:

Q - 2 State whether the given following system is homogenous or not. Also, how many solutions exist for the following system? **[05]**

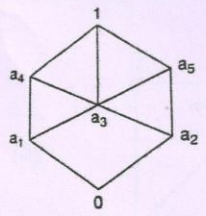
$$\begin{aligned} 4x - 3y - 2z &= 0 \\ 5x - 9y + 23z &= 0 \\ 3x + 2y + 7z &= 0 \end{aligned}$$

Q - 3 If $A = \begin{bmatrix} -1 & -1 \\ 2 & -2 \end{bmatrix}$ verify that $A^2 + 3A + 4I = 0$ and find A^{-1}. **[05]**

Q - 4 Let $A = \begin{bmatrix} 3 & -1 & 0 \\ 1 & 2 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 1 & -1 & 1 \\ -2 & 0 & 6 \end{bmatrix}$, $C = \begin{bmatrix} 1 & 0 & -2 \\ 3 & 1 & 1 \end{bmatrix}$ compute $-A$ and $A + B - C$. **[05]**

Q - 5 If $(L, \wedge, \vee)$ is complemented Lattice then state and prove De Morgan's Law. **[05]**

Q - 6 Consider the following Lattice **[05]**



(a) Which of the following are sublattices of L?

$L_1 = \{0, a_1, a_2, 1\}$

$L_2 = \{0, a_1, a_5, 1\}$

$L_3 = \{a_1, a_3, a_4, 1\}$

(b) Find complements if exist for elements a_1, a_2 and a_3.

(c) Is L distributive?

(d) Is L a complemented Lattice?

Q - 7 **(a)** Show that the following permutation is product of disjoint cycle $\begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 6 & 3 & 2 & 1 & 4 & 5 \end{pmatrix}$. **[05]**

(b) If $f = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 3 & 1 & 4 & 2 \end{pmatrix}$ and $g = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 1 \end{pmatrix}$, then find gfg^{-1}.

Q - 8 Find all the generators of the cyclic group $G = \{1,2,3,4,\times_5\}$. **[05]**

SECTION – II

Q - 1 **Define the following terms:** **[05]**

(i) Tree and Rooted Tree

(ii) Minimal Spanning Tree

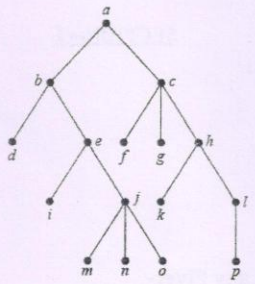
(iii) Hamiltonian Graph (Hamiltonian Path and Circuit)

(iv) In-degree, Out-degree and Total degree of a vertex

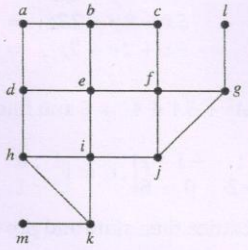
(v) Cycle and Wheel

From Q - 2 to Q - 8 attempt any Five:

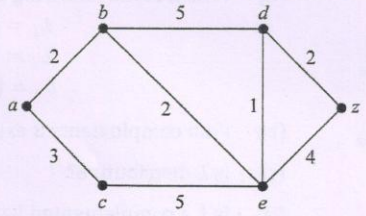
Q - 2 Determine the order in which a preorder traversal visits the vertices of the given ordered rooted tree. **[05]**



Q - 3 Use BFS algorithm to find a spanning tree of the graph given below **[05]**

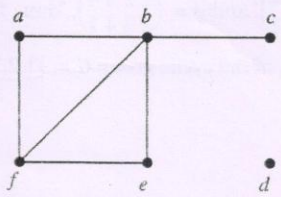


Q - 4 Find the length of a shortest path between a and z in the given weighted graph. **[05]**

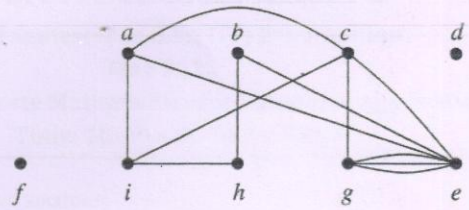


Q - 5 Find the number of vertices, number of edges and identify all isolated & pendant vertices in each case: **[05]**

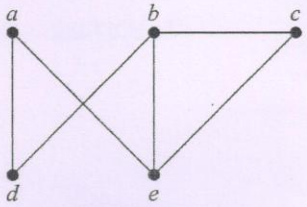
(a)



(b)



Q - 6 Does each of these lists of vertices form a path in the following graph? Which paths are simple? Which are circuits? What are the lengths of those that are paths? **[05]**

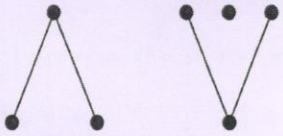


(a) a, e, b, c, b

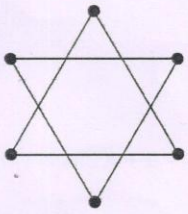
(b) a, e, a, d, b, c, a

Q - 7 Determine whether the given graph is connected: **[05]**

(a)

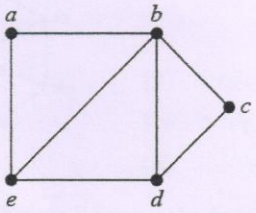


(b)

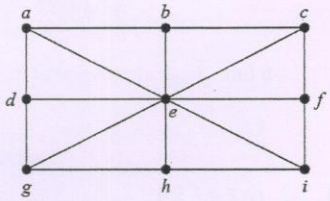


Q - 8 Determine whether the given graph has a Hamiltonian circuit. If it does, find such a circuit. If it does not, give an argument to show why no such circuit exists. **[05]**

(a)



(b)



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