P P SAVANI UNIVERSITY

Third Semester of B. Tech. Examination
November 2022
SESH2040 Discrete Mathematics

23.11.2022, Wednesday   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 sheets.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

SECTION – I

			CO	BTL
Q - 1	**Answer the following questions:**	**[05]**	CO	BTL
(i)	List the ordered pairs in the relation R from $A = \{0,1,2,3,4\}$ to $B = \{0,1,2,3\}$, where $(a, b) \in R$ if and only if $a + b = 4$		1	1
(ii)	Check whether the given function is bijective or not $f : Z \to Z, f(x) = x + 1$		1	4
(iii)	Define Lattices.		2	1
(iv)	Show that the binary operation $*$ defined on $(R, *)$ where $x * y = x^y$ is not associative.		3	1
(v)	Define Monoid.		3	1

Q - 2   Answer the following questions: (Attempt any two)   **[10]**

			CO	BTL
(a)	For each of these relations on the set $\{1, 2, 3, 4\}$, decide whether it is reflexive, symmetric, antisymmetric, and it is transitive		1	3,5

       (a) $\{(2, 2), (2, 3), (2, 4), (3, 2), (3, 3), (3, 4)\}$
       (b) $\{(1, 1), (1, 2), (2, 1), (2, 2), (3, 3), (4, 4)\}$
       (c) $\{(2, 4), (4, 2)\}$

			CO	BTL
(b)	Let $A = R - \{3\}$ and $B = R - \{1\}$. If $f : A \to B$ given by $f(x) = \frac{x-2}{x-3}$, show that f is bijective.		1	1,3
(C)	Consider the lattice $D_{60} = \{1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60\}$, the divisors of 60 ordered by divisibility.		2	6

       (a)   Draw the diagram of D_{60}.

       (b)   Find complements of 2 and 10, if they exist.

Q - 3   Answer the following questions: (Attempt any three)   **[15]**

			CO	BTL
(a)	If $B = D_{24}$ be a lattice, then find all the sublattice of D_{24}. Also draw the Hasse diagram.		2	2,6
(b)	Determine whether the relation with the directed graph shown is a partial order.		1	5
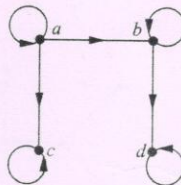
			CO	BTL
(c)	Prove that $G = \{1, -1, i, -i\}$ is group with respect to multiplication.		3	5
(d)	Prove that $M_2(Z)$ be the set of all 2×2 matrices over integers and $M_2(Z)$ is an abelian group under addition of matrices.		3	5

Q - 1 What rule of inference is used in each of these arguments?   [05]   4   2/3

    (a) Alice is a mathematics major. Therefore, Alice is either a mathematics major or a computer science major.

    (b) Jerry is a mathematics major and a computer science major. Therefore, Jerry is a mathematics major.

    (c) If it is rainy, then the pool will be closed. It is rainy. Therefore, the pool is closed.

    (d) If it snows today, the university will close. The university is not closed today. Therefore, it did not snow today.

    (e) If I go swimming, then I will stay in the sun too long. If I stay in the sun too long, then I will sunburn. Therefore, if I go swimming, then I will sunburn.

Q - 2 Are these proposition equivalent $(p \to r) \vee (q \to r) \equiv (p \wedge q) \to r$.   [05]   4   3/5
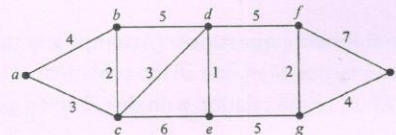
Q - 3 Determine whether the given pair of directed graphs are isomorphic.   [05]   5   4
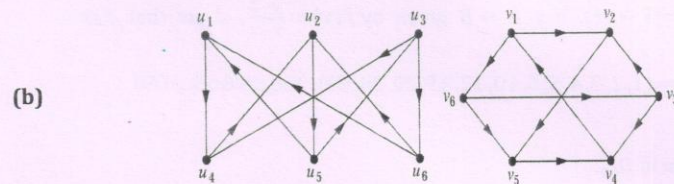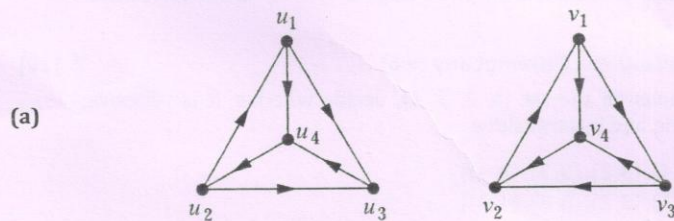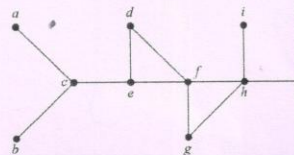

Q - 4 Find the length of a shortest path between a and z in the given weighted graph.   [05]   5   4/6
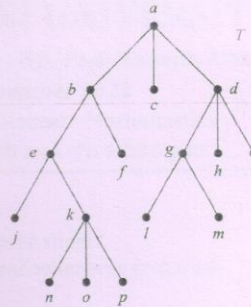

Q - 5 Use depth-first search to find a spanning tree for the graph shown in Figure.   [05]   5   4/6

Q - 6   In which order does a Post order traversal visit the vertices of the ordered rooted tree *T* shown in Figure?   [05]   5   6
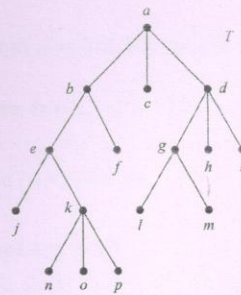

OR

Q - 6   In which order does an In-order traversal visit the vertices of the ordered rooted tree *T* in Figure?   [05]   5   6

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CO   : Course Outcome Number   BTL   : Blooms Taxonomy Level

Level of Bloom's Revised Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create