

JK Lakshmipat University Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination, December 2025

B. Tech., Odd Semester, 2025-26

Roll No.

AS1210: Graph Theory

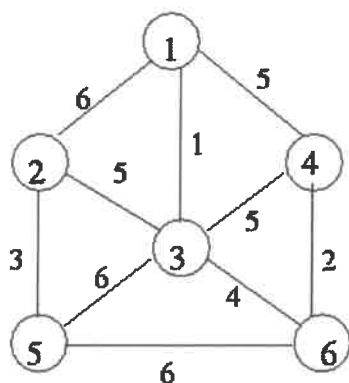
Time: 3.0 hours

Max. Marks: 40

Instructions to students:

1. Do not write anything other than your roll number on the question paper.
2. Specify if you find any ambiguity in the questions. Justify and solve the question after removing that ambiguity.
3. Draw all the figures neatly, specifying all the parameters.
4. **State theorems and definitions properly in mathematical language, if they are referred to in the answers.**

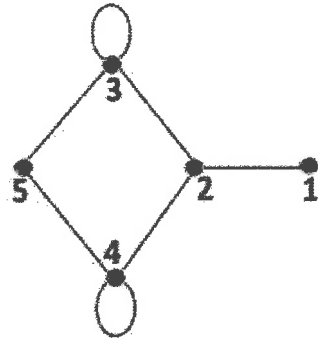
- Q. 1 Find the chromatic number of the following types of graphs by writing a reason for the answer. 3.0
(CO2)
- a) Wheel Graph W_6
b) Cycle Graph C_7
c) Bipartite Graph $K_{1,3}$
- Q. 2 a) Find the number of perfect matchings in a complete bipartite graph $K_{n,n}$. 2.0 + 2.0
b) Find the number of perfect matchings in a complete graph K_n . (CO1,2)
- Q. 3 a) Suppose G is a non-directed graph with 12 edges. If G has 6 vertices, each of degree 3, and the rest have degree less than 3, find the minimum vertices G can have. 2.0 + 2.0
b) A connected plane graph has 10 vertices each of degree 3. How many regions does a representation of this planar graph split the plane? (CO1,2)
- sQ. 4 Using decomposition theorem find the chromatic polynomial of C_4 . 4.0
(CO4)
- Q. 5 Use suitable algorithm to find the minimal spanning tree from the following graph. Find the total weight of this tree. 4.0
(CO3,4)



- Q. 6 a) Find the size of the edge covering of a complete bipartite graph $K_{m,n}$. 2.0 + 2.0
b) Find the vertex covering number of a cycle graph C_n . (CO2)

- Q. 7 Let A be the adjacency matrix of the graph with vertices $\{1,2,3,4,5\}$. Let $\lambda_1, \lambda_2, \lambda_3, \lambda_4$, and λ_5 be the five eigenvalues of A . Note these eigenvalues need not be distinct. The value of $\lambda_1 + \lambda_2 + \lambda_3 + \lambda_4 + \lambda_5 =$ _____

4.0
(CO2)



- Q. 8 State the Hall's marriage theorem. There are 3 family members invited to more than one marriage function scheduled on a similar date and time. A function cannot be attended by more than one family member. Apply Hall's marriage theorem to see whether all the faculty members will be able to attend one of the marriage functions at which they are invited.

5.0
(CO1,2)

Family Member	Marriage Function
A	W, Y, Z
B	X, Z
C	X, Y

- Q. 9 Use the following network to answer the following.
- Find all the s - t cuts and their capacities in the following network diagram. Find the maximal flow.
 - Use Ford-Fulkerson algorithm to find the maximal flow.

4.0 + 4.0
(CO2)

