AHMEDABAD UNIVERSITY
School of Engineering and Applied Science
2025-26 Winter

CSE619 Network Science
Mid-Term Examination
Wednesday 25 February 2026. 17:00 – 18:00

Name:	**Roll no.**	**A**	**U**	**2**							**Marks** /25

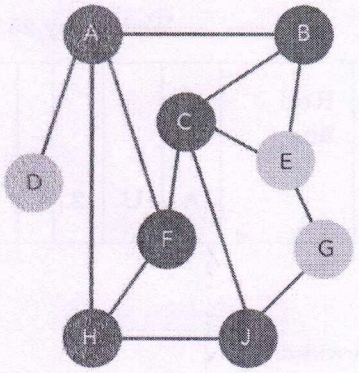
Instructions:
1. All questions are compulsory.
2. Please write the answer in the space provided.

Enjoy solving the paper!

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1. Consider a complete graph on 4 vertices. Add +/- signs on the edges to create a graph with: (a) all triangles balanced (b) one triangle unbalanced (c) two triangles unbalanced (d) three triangles unbalanced (e) all triangles unbalanced. *[5 marks]*

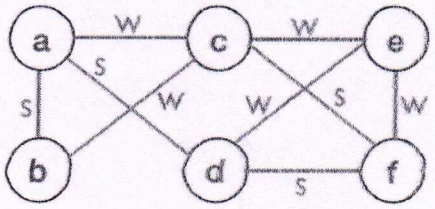
2. Consider the following graph and calculate:



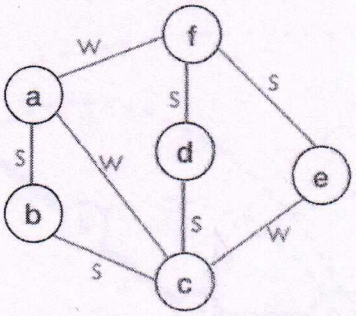
(a) whether the network is homophilic or not? *[4 marks]*

(b) If you are allowed to add a single edge to make it as much more homophilic as possible (than it currently is), where would you add the edge? *[1 mark]*

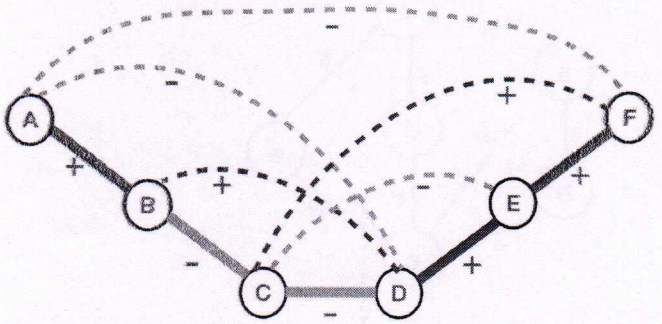
3. In the social networks depicted in the figures below, with each edge labeled as either a strong (s) *or weak (w) tie, which vertices satisfy the Strong Triadic Closure Property, and which do not?* Provide an explanation for your answer. *[5 marks]*
(a)



(b)



4. In the signed network depicted below:



(a) Check if the network is balanced. If unbalanced, provide evidence. *[1 mark]*

(b) Use Alabandi's (AL21) method to determine the number of edges (could be zero) to flip in order to balance the network (if it is unbalanced). The thick lines indicate edges in the spanning tree. *[4 marks]*

5. Consider the two-player game described by the payoff matrix below:

		Player B	
		L	*R*
Player A	*U*	2, 3	0, 0
	D	0, 0	5, 6

(a) Find all pure-strategy Nash equilibria for this game. *[1 mark]*

(b) This game also has a mixed-strategy Nash equilibrium; find the probabilities the players use in this equilibrium. *[4 marks]*