

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI**  
(MID SEMESTER EXAMINATION SP2023)

CLASS: BTECH  
BRANCH: CSE

SEMESTER : VI  
SESSION : SP2023

SUBJECT: CS307 GRAPH THEORY

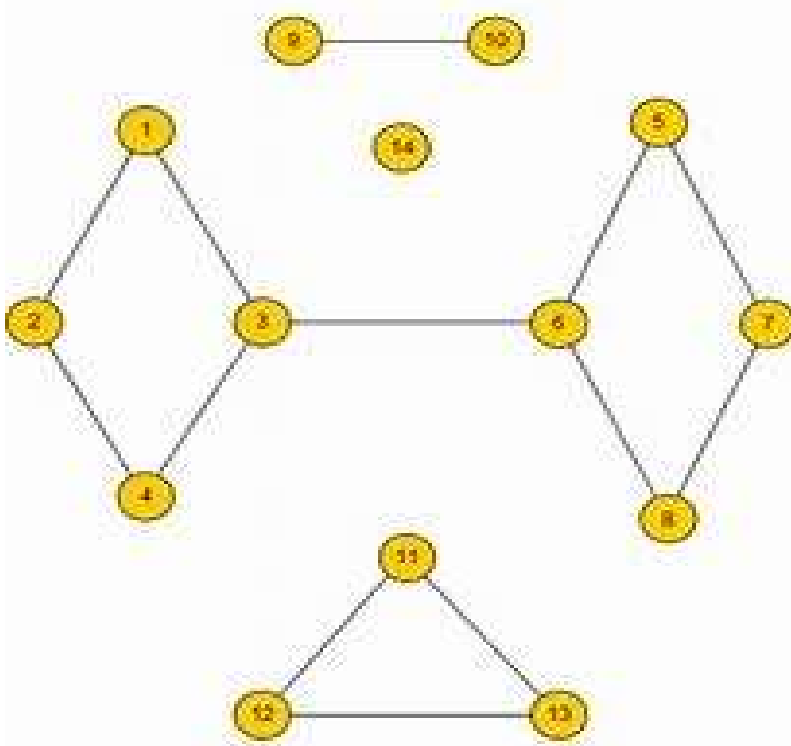
TIME: 02 Hours

FULL MARKS: 25

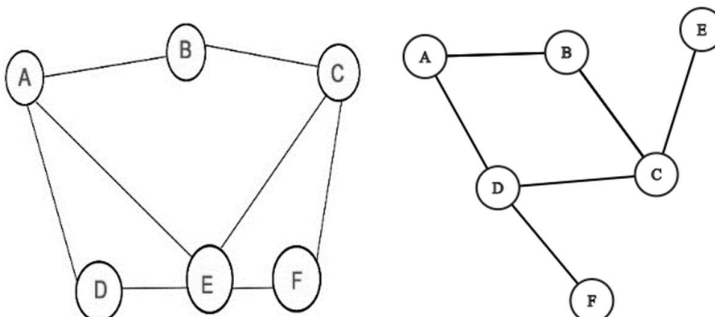
**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

- |  |     |       |
|--|-----|-------|
|  | CO  | BL    |
| Q.1(a) Prove that number of odd degree vertices in a simple graph is even.                                     | [2] | CO1 2 |
| Q.1(b) Can we construct a graph with 30 vertices, 5 components and 24 edges. Answer yes/No with justification. | [1] | CO1 3 |
| Q.1(c) Identify pendent, isolated vertex. Calculate the degree of all vertices.                                | [2] | CO1 2 |

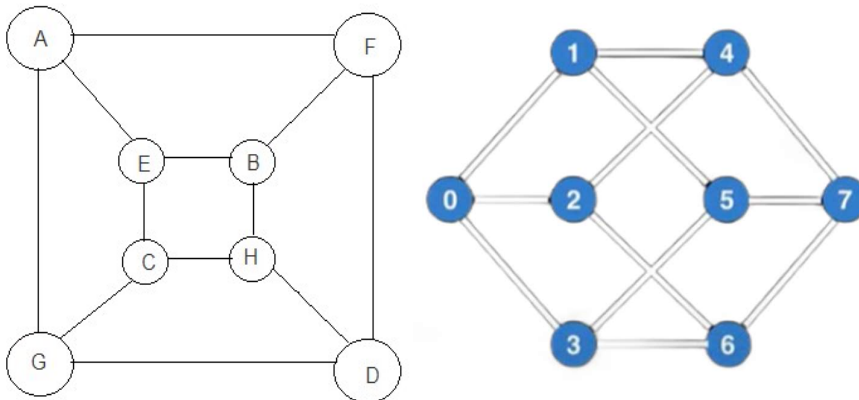


- Q.2(a) Find graph  $G^c \cap H$  from given graphs G and H. Where  $G^c$  stands for complement of G. [2] CO1 3



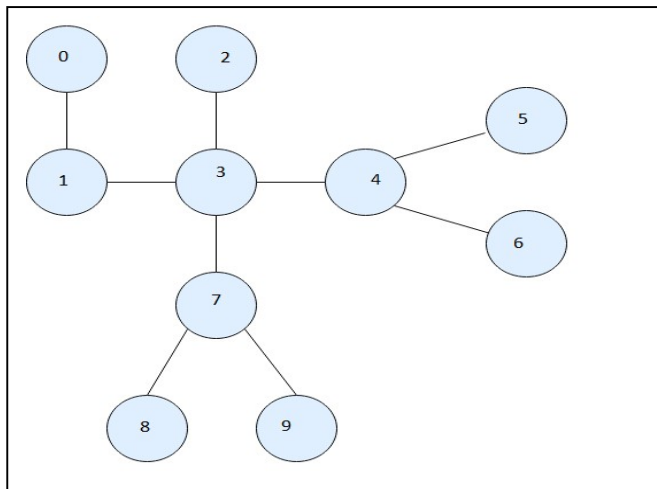
Q.2(b) Proof the two given graphs are isomorphic.

[3] CO1 4



Q.3(a) Find Eccentricity and centre of given graph.

[1] CO1 4



Q.3(b) Derive a formula to find height of k-ray tree.

[2] CO1 2

Q.3(c) Prove that a simple acyclic graph with n vertices and n-1 edges is a tree.

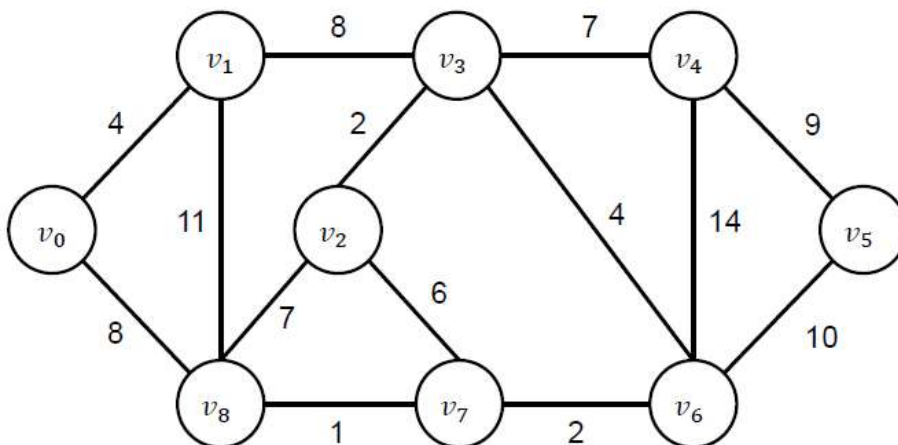
[2] CO1 2

Q.4(a) Proof that a graph with 9 vertices with sum of degree of all vertices = 18 is not a tree.

[2] CO1 3

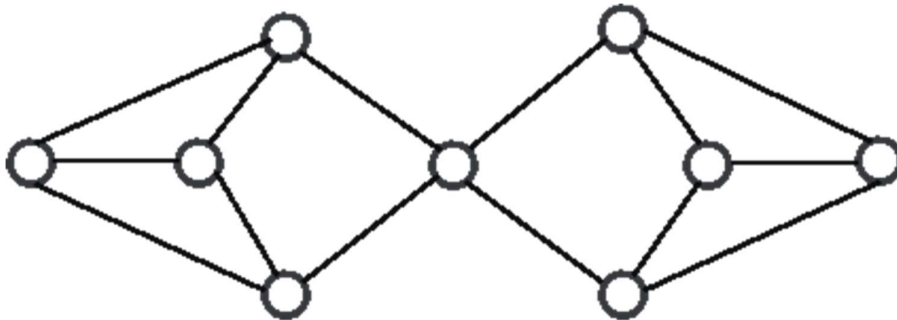
Q.4(b) Find minimum spanning tree in given graph using prims algorithm.

[3] CO1 3



Q.5(a) Show the given inequality is true for given graph.  
 $K(G) \leq \lambda(G) \leq \delta(G)$

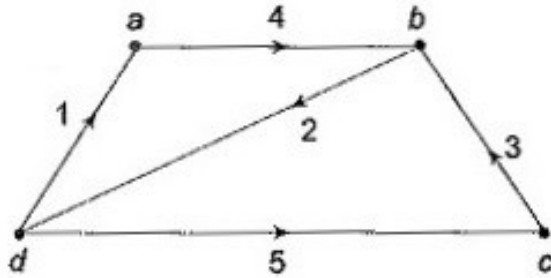
[1] CO2 2



Where  $K(G)$  is vertex connectivity,  $\lambda(G)$  is edge connectivity and  $\delta(G)$  is smallest vertex degree in  $G$ .

Q.5(b) Find the cut-sets matrix of given graph.

[2] CO2 3



Q.5(c) Find max flow in given graph

[2] CO2 3

