K20U 1537

Reg. No. : ....

Name : ....

V Semester B.Sc. Degree (CBCSS – Reg./Sup./Imp.) Examination, November 2020
(2017 Admn. Onwards)
CORE COURSE IN MATHEMATICS
5B09 MAT : Graph Theory

Time : 3 Hours   Total Marks : 48

PART – A

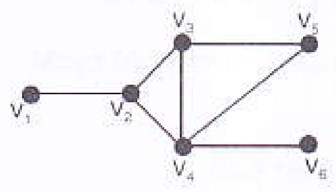
Answer **all 4** questions : **(4×1=4)**

1. Draw a graph on 4 vertices having a cut vertex. Mark the cut vertices.
2. Sketch 2 isomorphic trees on 4 vertices.
3. Plot a strict digraph on 4 vertices.
4. Sketch a symmetric digraph on 4 vertices.

PART – B

Answer **any 8** questions : **(8×2=16)**

5. Define a complete graph. Draw the graph K_5.
6. Picturise all non isomorphic graphs on 3 vertices.
7. If e = xy is a cut edge of a connected graph G, prove that there exist vertices u and v such that e belongs to every u-v path in G.
8. Find the cut edges and the cut vertices of the graph given below.



P.T.O.

9. Draw a 2 regular graph on 4 vertices and draw one spanning graph of the same.

10. For a connected graph G, define the terms diameter and eccentricity.

11. Find a covering and a minimal covering for the wheel graph W_5.

12. Give an example of an Eulerian graph. Explain why it is Eulerian.

13. Explain the terms Directed Walk and Directed Cycle.

14. Define the term tournament. Sketch a tournament on 3 vertices.

PART – C

Answer **any 4** questions : **(4×4=16)**

15. Plot all non isomorphic graphs on 4 vertices.

16. If a simple graph G is not connected, prove that G^c is connected.

17. Prove that a graph G with at least 3 vertices is 2-connected if and only if any two vertices of G lie on a common cycle.

18. Prove that a graph is a tree if and only if any two distinct vertices are connected by a unique path.

19. For a graph G on n vertices, define the terms independence number α and the covering number β of G. Further show that $\alpha + \beta = n$.

20. Describe Königsberg bridge problem. Represent the problem graphically. Does the problem has a solution ? Explain.

PART – D

Answer **any 2** questions : **(2×6=12)**

21. Show that a graph G is bipartite if and only if it contains no odd cycle.

22. Prove that a graph G with at least three vertices is 2-connected if and only if any two vertices of G are connected by at least 2 internally disjoint paths.

23. Establish the claim : A graph is Eulerian if and only if it has odd number of cycle decompositions.

24. Prove that every tournament contains a directed Hamiltonian path.