

2021

**Applied Mathematics with Oceanology and
Computer Programming**

[P.G.]

(CBCS)

(M.Sc. First Semester EndExaminations-2022)

MTM – 106

(GRAPH THEORY)

Full Marks: 25

Time: 01 Hr

*The figures in the right hand margin indicate marks
Candidates are required to give their answers in their own words as
far as practicable
Illustrate the answers wherever necessary*

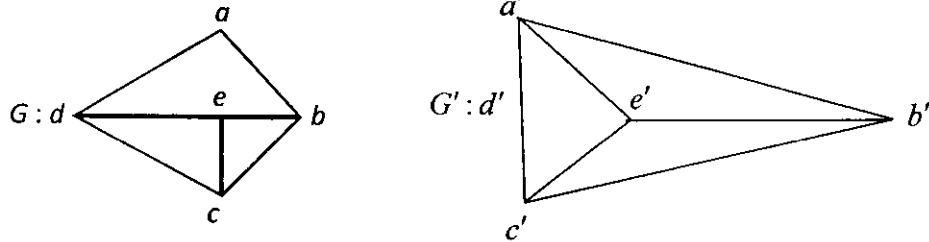
- 1. Answer any two questions 2x2=4**
- a) Write down the properties of dual of a planar graph.
 - b) Prove that every connected graph has at least one spanning tree.
 - c) Proof that every tree with two or more vertices is 2-chromatic.
 - d) Define fundamental cut set of a graph.

(2)

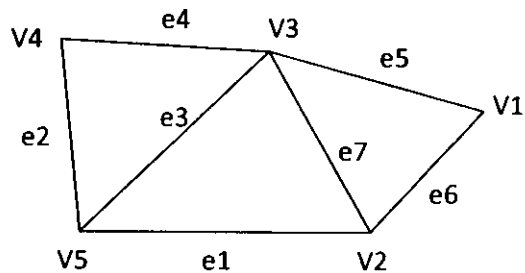
2. Answer any two questions

4x2=8

a) Show that the graphs G and G' are isomorphic.



b) Write the properties of dual graph. Find the geometrical dual of the graph given below. 1+3



- c) Define binary tree. Find the number of pendant vertices in a binary tree with n vertices.
- d) Show that a connected graph of n vertices and $(n-1)$ edges is a tree.

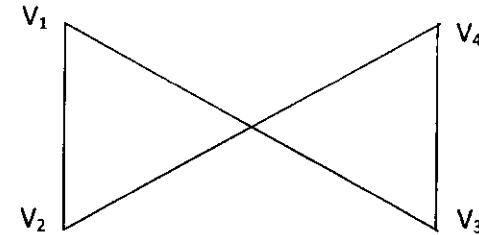
3. Answer any one question

8x1=8

- a) i) Does there exist a 4-regular graph on 6 vertices? If so construct a graph.

(3)

ii) Consider the graph shown in figure, find the number of walks of length three from V_2 to V_4 and also check the connectedness of the graph.



- b) i) Prove that a graph with n vertices is always has a Hamiltonian path if the sum of the degree of every pair of vertices v_i, v_j in G satisfies the condition $\deg(v_i) + \deg(v_j) \geq n-1$.
- ii) Define chromatic number, Find the chromatic polynomial of a complete graph with n vertices. 4+4

[Internal Marks – 05]