C (Printed Pages 7)

Roll No. _____

22/5068

B.C.A. Examination, 2022

(Fourth Semester)

Fifth Paper [E - I]

(Graph Theory and Combinatorics)

Time : Three Hours] *[Maximum Marks : 75*

Note : Attempt any **five** questions. **All** questions carry equal marks.

1. (a) Define a simple graph. Draw all simple graphs with the four vertices {u,v, w, x} and two edges, one of which is (u, v) 10

(b) Suppose a graph has vertices of degrees 1, 1, 4, 4 and 6. How many edges does the graph have? 5

2. (a) State and prove the handshaking theorem. 6

(b) Draw a graph with specified properties or explain why on such graph exists 9

(i) Graph with four vertices of degrees 1, 2, 3 and 3

(ii) Graph with four vertices of degrees 1, 2, 3 and 4

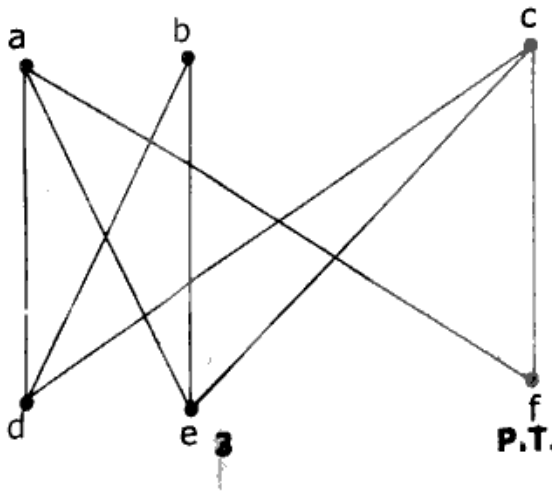
(iii) Simple graph with four vertices of degrees 1,2,3 and 4

3. (a) Define the directed graph with the help of suitable example. 7

(b) Find directed graph that has the adjacency https://www.mgkvponline.com matrix $A = \begin{bmatrix} 1 & 0 & 1 & 2 \\ 0 & 0 & 1 & 0 \\ 0 & 2 & 1 & 1 \\ 0 & 1 & 1 & 0 \end{bmatrix}$

4. (a) Define planar graph with the help of suitable example. 7

(b) Determine Whether the graph below is planar. If so, draw it so that no edges cross. 8



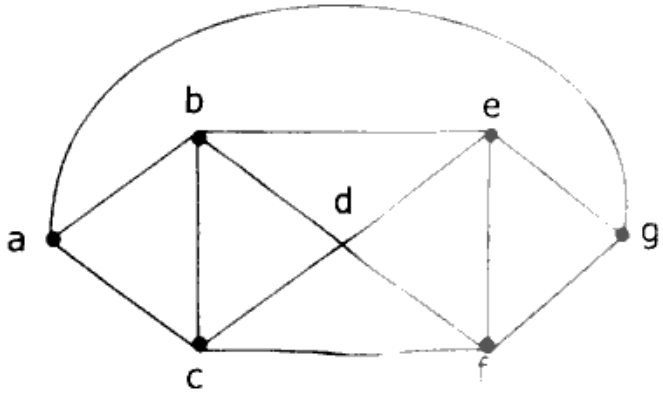
5. (a) What is tree? Give the properties of tree and explain with diagram. 5

(b) Explain why graphs with the given specification do not exist. 10

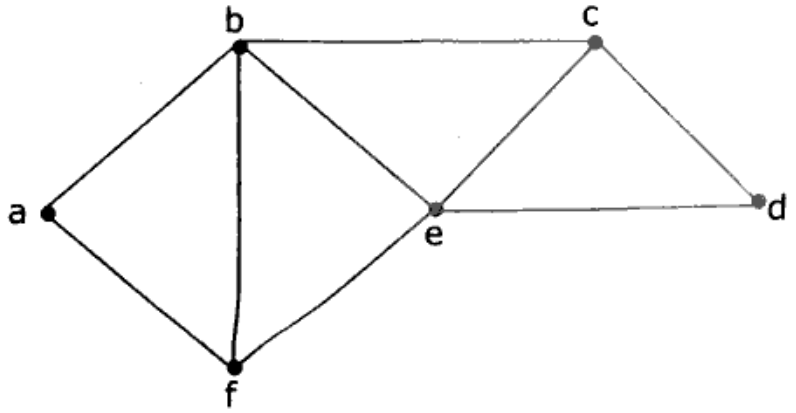
(i) Tree, twelve vertices fifteen edges.

(ii) Tree, five vertices , total degree.

6. (a) Define the chromatics number of a graph. What is the chromatic number of the graph G shown below? 7



(b) What is meant by the spanning tree of a graph? Find all the spanning tree for the graph below: 8

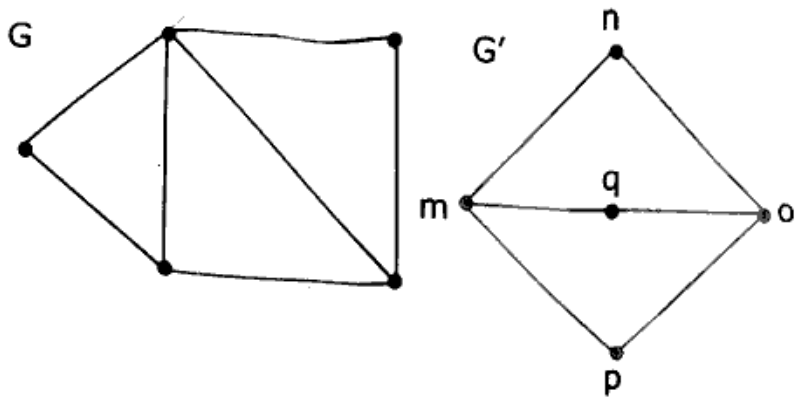


7. (a) What is the transpose of a matrix.

if $A = \begin{bmatrix} 4 & -2 & 0 & 6 \\ 2 & -3 & 1 & 9 \\ 0 & 7 & 5 & -1 \end{bmatrix}$ the find A^t=? 7

(b) What are isomorphic graphs? Determine whether the graph G and G^1 giv-

en below are isomorphic 8



8. (a) Find the number n of ways that an organization consisting of 15 members can elect a president, treasurer and secretary (assuming no person is elected to more than one position. 7

(b) There are four bus lines between A to B, and three bus lines between B and C. Find the number of ways a person can travel : 8

(i) By Bus from A to C by way of B.

(ii) Round trip by bus from A to C by way of B.

(iii) Round trip by bus from A to C by way of B, if the person does not want to use a bus line more than once.