2023

B.A./B.Sc.

Fourth Semester

SKILL ENHANCEMENT COURSE – 2

MATHEMATICS

Course Code:MAS 4.11

(Graph Theory)

Total Mark: 35 *Pass Mark: 14*

Time: 2 hours

Answer five *questions, taking* one *from each unit.*

UNIT–I

1. (a) Determine the number of edges in a graph with 6 vertices, 2 of degree 4 and 4 of degree 2. Draw two such graphs. 4

   (b) Draw a graph having the given properties or explain why no such graph exists 3

   (i) Graph with 4 vertices of degree 1,1,2,3

   (ii) Graph with 4 vertices of degree 1,1,3,3

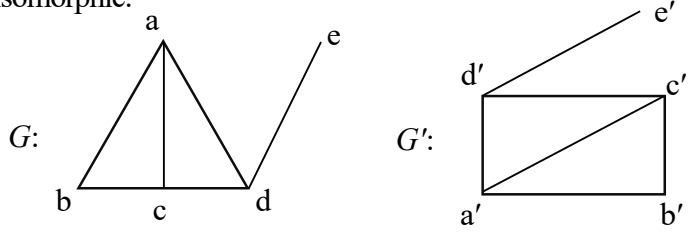
   (iii) Graph with 6 vertices each of degree 3

2. (a) Using Hakimi- Havel theorem find x if [8 x 7 6 6 5 4 3 3 1 1 1] is a graphical vector. 4

   (b) Define complete and regular graph. Does a 3-regular graph on 7 vertices exist. 3

UNIT–II

3. (a) Use adjacency matrix to show that the following graphs are isomorphic. 4

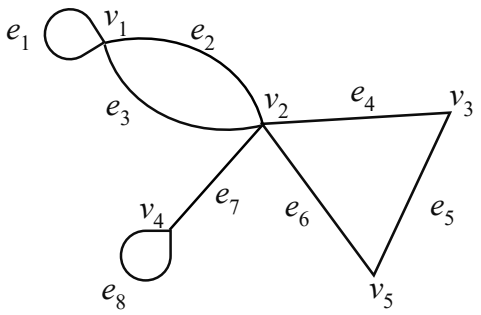


(b) Prove that if a connected graph G is decomposed into two subgraphs H_1 and H_2, there must be at least one vertex common to H_1 and H_2. 3

4. (a) Draw the graph represented by the adjacency matrix 3

$$\begin{bmatrix} 1 & 2 & 0 & 0 \\ 2 & 0 & 1 & 1 \\ 0 & 1 & 2 & 2 \\ 0 & 1 & 2 & 0 \end{bmatrix}$$

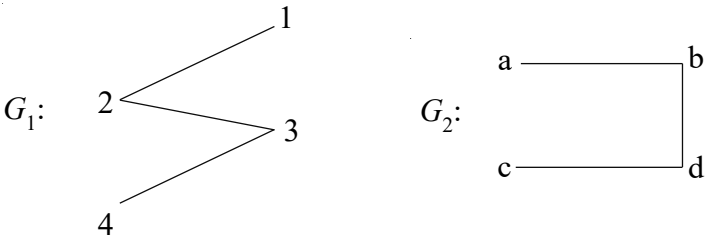
(b) Represent the pseudograph using an incidence matrix 4



UNIT–III

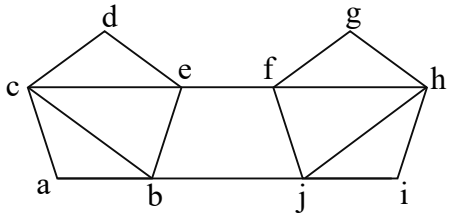
5. (a) For an undirected graph $G = (V, E)$ with $a, b \in V$, $a \neq b$, prove that if there exists a trial (in G) from a to b then there is a path (in G) from a to b. 4

(b) Show that the two graphs are isomorphic 3



6. (a) Prove that a connected graph G is Eulerian if and only if the degree of each vertex of G is even. 3

(b) Use Fleury's algorithm to construct an Euler circuit for the graph. 4



UNIT–IV

7. (a) State and prove Ore's theorem. 5

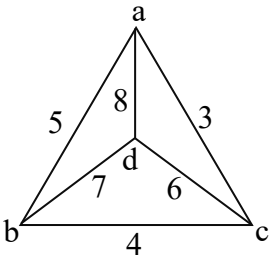
(b) Draw a graph which contains the following: 2

(i) An Eulerian circuit and a Hamiltonian cycle.

(ii) An Eulerian circuit but not a Hamiltonian cycle.

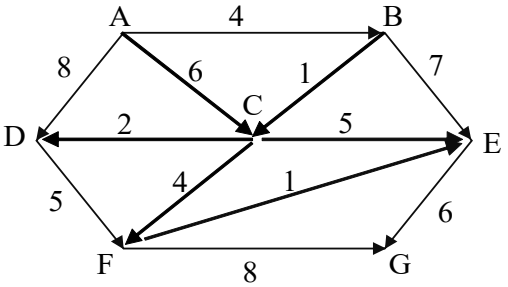
8. (a) State and prove Dirac's theorem. 5

(b) Solve the travelling salesman problem for the weighted graph. 2



UNIT–V

9. (a) Using Dijkstra's algorithm find the shortest path and distance between the vertices a to g for the directed graph. 7



10. (a) Obtain the shortest distance matrix between all vertices using Floyd Warshall algorithm. 7