

B.Sc. Semester-IV Examination, 2022-23

MATHEMATICS [Honours]

Course ID : 42115 Course Code : SH/MTH/405/SEC-2

Course Title : Graph Theory

Time : 2 Hours Full Marks : 40

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

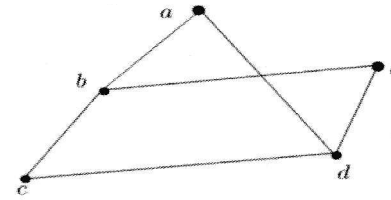
Notations and symbols have their usual meaning.

UNIT-I

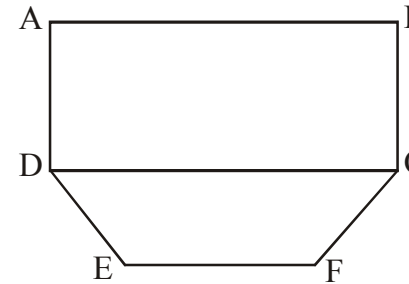
1. Answer any **five** from the following questions:

2×5=10

- a) Define regular graph with an example.
- b) Justify whether it is possible or not to draw a graph with 12 vertices having 13 edges.
- c) How many edges are there in a simple graph with 10 vertices each of degree 6?
- d) Find the number of edges in the graph K_{14} .
- e) Find the complement of the given graph



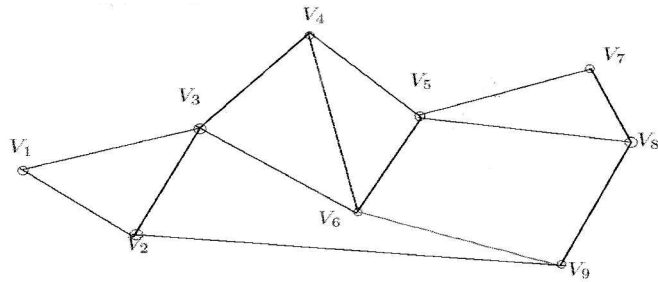
f) Examine the following graph is bipartite or not



g) Draw the graph whose incidence matrix is given by

$$\begin{pmatrix} 0 & 1 & 0 & 0 & 1 & 1 \\ 1 & 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 1 \\ 0 & 1 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \end{pmatrix}$$

h) Find a spanning tree of the following graph.



UNIT-II

2. Answer any **four** from the following questions:

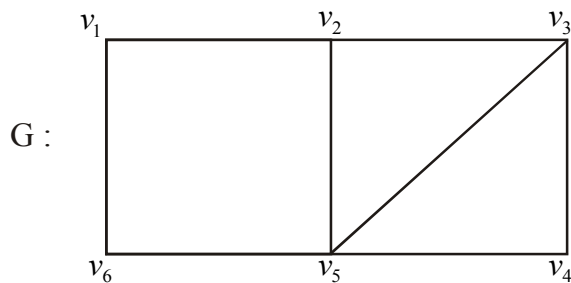
$5 \times 4 = 20$

a) i) Prove that a bipartite graph with n vertices

has at most $\frac{n^2}{4}$ edges.

ii) Is there any graph with five edges and five vertices with degrees 1, 3, 3, 4, 5? $3+2$

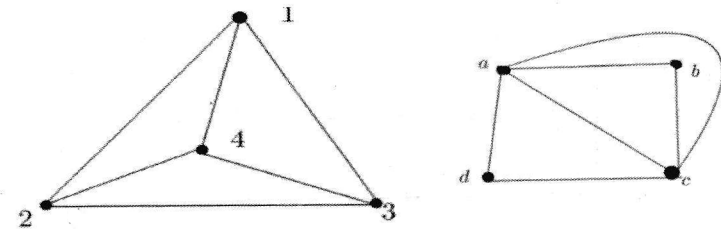
b) A graph G is given below:



Find the distance between v_1 and v_4 ;
 $\text{diam}(G)$; one circuit which includes v_1 ;
 eccentricity of v_1 ; circumference of G .

c) Prove that if a graph G is connected, then it has a spanning tree.

d) Define isomorphism of two graphs. Determine whether the following graphs are isomorphic with proper justification.



e) Prove that a connected graph G is a Euler graph if and only if all vertices are of even degree.

f) From A salesman has to visit four markets $\{M_1, M_2, M_3, M_4\}$ starting from M_1 and return to M_1 after visiting all other markets exactly once. Find the cost saving optimal route where the travelling cost matrix between the markets is given below:

	M_1	M_2	M_3	M_4
M_1	0	10	15	20
M_2	5	0	9	10
M_3	6	13	0	12
M_4	8	8	9	0

UNIT-III

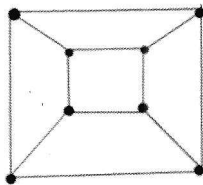
3. Answer any **one** of the following questions:

10×1=10

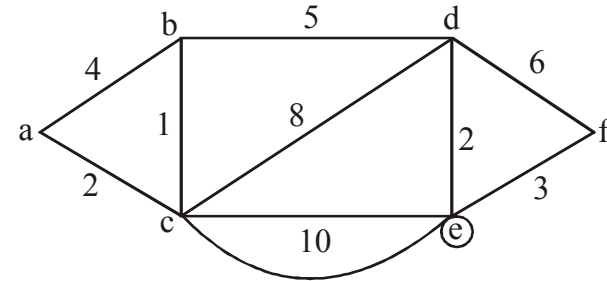
a) i) Define Binary tree. Let p be the number of pendent vertices in a binary tree with n vertices, then show that $p = \frac{n+1}{2}$

ii) What is the difference between walk and path in graph theory? When a connected graph becomes a disconnected graph?

iii) Find the Hamiltonian circuit of the given graph: (1+3)+4+2



b) i) Using Dijkstra's Algorithm, find the length of the shortest path of the following graph from the vertex a to f.



ii) If G is a connected graph and every vertex of G has even degree, then prove that G has a Euler Circuit. 5+5

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MATHEMATICS [Honours]

Course ID : 42115 Course Code : SH/MTH/405/SEC-2

Course Title : Operating System : Linux

Time : 2 Hours Full Marks : 40

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UNIT-I

1. Answer any **five** from the following questions:

2×5=10

- What are the basic elements of a Linux Operating System?
- Write two differences between Linux Kernel and Linux Shell.
- What is Linux pipe?
- What is the purpose of CAT command in Linux?
- What is the role of passwd command in Shell?
- What is dual booting?
- Write full form of GUI and CLI?
- What is Linux Kernel?

UNIT-II

2. Answer any **four** from the following questions:

5×4=20

- Write functions of five system calls used for process management in Linux.
- Write commands for the following: 1×5=5
 - List all files beginning with 'A'.
 - To see all mounted drives.
 - To sort file 1 & file 2 in a single file.
 - To search the word picture from file 1.
 - To view first 15 lines of file 1.
- What is CLI? Write advantages and disadvantages of it.
- Explain briefly different shells used in different Linux operating systems.
- Why Linux considered as more secured than other OS?
- What is CLI? Write advantages and disadvantages of it.

UNIT-III

3. Answer any **one** of the following questions:

10×1=10

- What are the file types available in Linux? Discuss file operators with suitable examples.
- Explain Linux architecture with suitable diagram.