

B.Sc. Semester-IV Examination, 2022-23**MATHEMATICS [Programme]**

Course ID : 42110 Course Code : SP/MTH/404/SEC-2

Course Title : Graph Theory

Time : 2 Hours

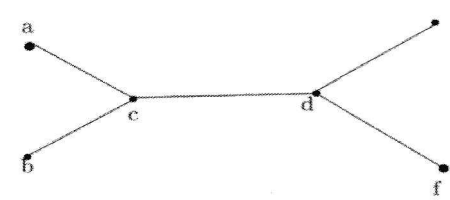
Full Marks : 40

*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 graph and subgraph.
- b) Does there exist a simple graph with six vertices having degrees 5, 5, 4, 2, 2, 2? Justify your answer.
- c) Define Isolated vertex, Pendent vertex with examples.
- d) What is the complete graph. Draw a complete graph.

e) Find the centre of the given graph.



- f) Define bipartite graph.
- g) Find the number of edges in the graph K_5 .
- h) Draw the graph with the following matrix as adjacency matrix

$$\begin{array}{c}
 v_1 \quad v_2 \quad v_3 \quad v_4 \\
 \begin{array}{l}
 v_1 \\
 v_2 \\
 v_3 \\
 v_4
 \end{array}
 \begin{bmatrix}
 0 & 1 & 0 & 1 \\
 0 & 1 & 0 & 1 \\
 0 & 1 & 0 & 1 \\
 1 & 0 & 1 & 0
 \end{bmatrix}
 \end{array}$$

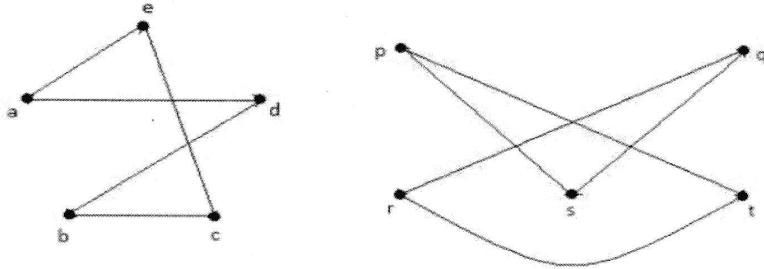
UNIT-II2. Answer any **four** from the following questions:

5×4=20

- a) i) Define minimally connected graph.
ii) Prove that a graph is minimally connected iff it is a tree. 1+4
- b) Prove that any connected graph with n vertices and (n-1) edges is a tree.

[Turn Over]

c) When two graphs are isomorphic? Examine whether the following two graphs are isomorphic.



d) What is spanning tree. Show a tree has exactly one spanning tree. Also draw an example of a spanning tree of a graph.

e) Person has to visit four cities {A, B, C, D} starting from A and return to A after visiting all other cities exactly once. Find the cost saving optimal route where the travelling cost matrix between the markets is given below:

	A	B	C	D
A	0	4	1	9
B	3	0	6	11
C	4	1	0	2
D	6	5	4	0

f) Show that a graph is bipartite if and only if it has no odd cycle. 5

UNIT-III

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

10×1=10

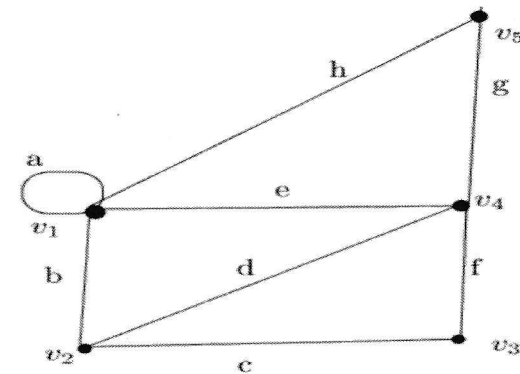
a) i) Show that in a directed graph sum of the in-degrees and the sum of the out-degrees of the vertices are same.

ii) Show that a graph is connected iff G has a spanning tree.

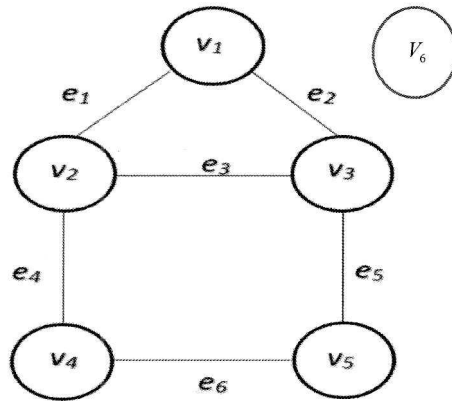
iii) Let A be the adjacency matrix of a finite simple graph. Prove that $trace(A) = 0$.

3+4+3

b) i) What is walk in graph theory? When a walk is called path? Find an open Walk in the given graph



- ii) Define incidence matrix and find the incidence matrix of the following graph. How to find isolated vertex from the incidence matrix?



5+5

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

MATHEMATICS [Programme]

Course ID : 42110

Course Code : SP/MTH/404/SEC-2

Course Title : Operating System : Linux

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

- What is dual booting?
- What is the main difference between Linux and Unix?
- Write full form of GUI and CLI?
- What is Linux Kernel?
- What is init process in Linux?
- What is the shall password?
- Name different Linux Shell.
- What is “grep” command?

UNIT-II

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

$$5 \times 4 = 20$$

- a) Explain different system calls in linux.
- b) Why Linux considered as more secured than other OS.
- c) What are the purposes of following commands in Unix : chmod, grep, cat date, who?
- d) Explain basic components of Linux.
- e) What are the file types available in Linux?
- f) Explain major differences between Linux and Windows operating systems.

UNIT-III

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

$$10 \times 1 = 10$$

- a) Describe various APIs of Message queues that are used for inter process communication.
- b)
 - i) Write a short note on Linux architecture.
 - ii) What is CLI? Write the advantages and disadvantages of it. $4 + (2 + 4)$