Bachelor of Science (Information Technology) (I.T.) Semester—V (CBS) Examination

GRAPH THEORY

Paper—6

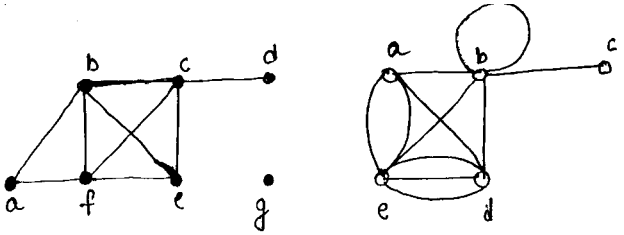
Time : Three Hours] [Maximum Marks : 50

N.B. :— (1) All questions are compulsory and carry equal marks.
(2) Draw neat and labelled diagrams wherever necessary.

EITHER

1. (A) Define the following :
   (i) Simple graph
   (ii) Multi graph
   (iii) Directed graph
   (iv) Adjacent graph
   (v) Isolated node. 5

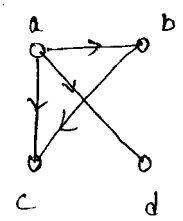
   (B) What are the degrees of the vertices in the graphs G and H displayed in the following figures :



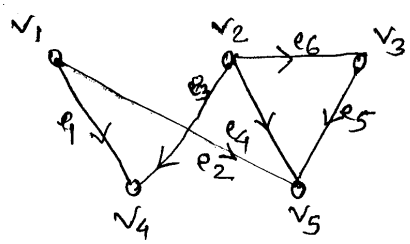
   The undirected graphs G and H . 5

OR

   (C) Define Adjacency matrix. Give an adjacency matrix to represent the graph shown below : 5



   (D) Define incidence matrix. Represent the graph shown below with an incidence matrix : 5



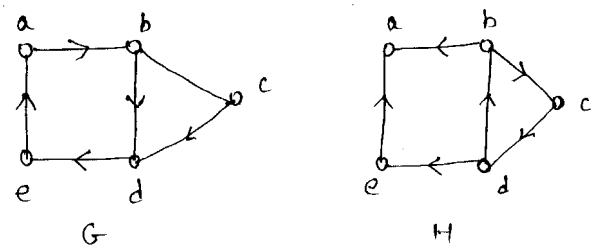
EITHER

2. (A) Define the following :
   (i) Walk
   (ii) Trail
   (iii) Tour
   (iv) Path
   (v) Circuit. 5

   (B) Define and explain Dijkstra's shortest path algorithm. 5

OR

(C) Are the directed graphs G and H as shown in the following figures strongly connected ? Are they weakly connected ?



Figures : The Directed Graphs G and H. 5

(D) Write short notes on :

(i) Cut-vertex

(ii) Vertex connectivity. 5

EITHER

3. (A) Prove that, a connected graph with n vertices is a tree if and only if, it has (n – 1) edges. 5

(B) Define the following :

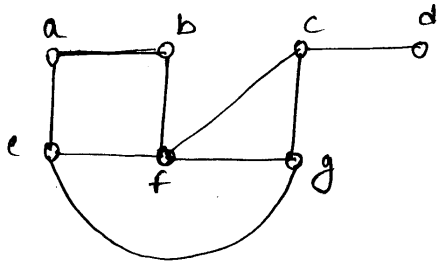
(i) Tree

(ii) Level of a tree

(iii) Binary tree. 5

OR

(C) Find a spanning tree as shown in the following figure :



The Simple Graph G. 5

(D) What is the postfix form of the expression $((x + y) \uparrow 2) + ((x - 4)/3)$. 5

EITHER

4. (A) What is a directed graph ? Explain types of directed graph. 5

(B) Find the maximum flow in the directed network shown in the figure and prove that if is maximum.

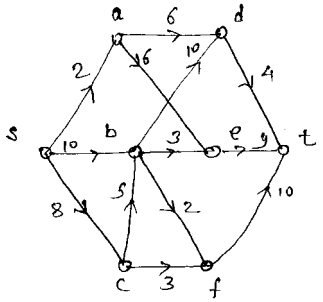


Figure : A directed graph. 5

OR

(C) Which of the directed graphs in the given figure have an Euler circuit ? Of those that do not, which have an Euler path ?

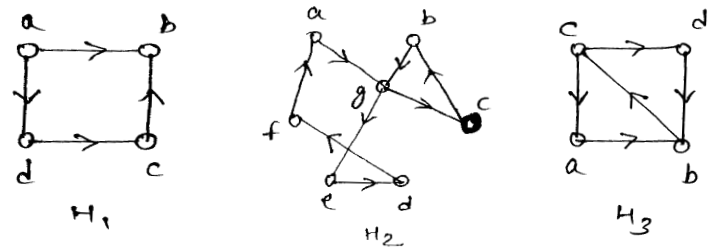
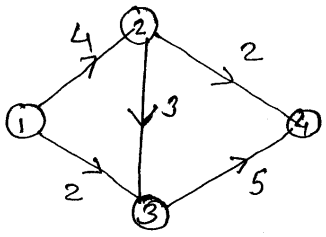


Figure : The Directed Graph H_1, H_2 and H_3. 5

(D) Label the given network in the following figure with a flow that conservers flow at each node, except the source and the sink. Each edge is labelled with its maximum capacity.



5

5. Attempt **ALL** :

(A) Explain matrix representation of a graph. 2½

(B) Define the cut-vertex and connectivity. 2½

(C) State Kruskal's Algorithm. Give its advantages. 2½

(D) Define network and flows with example. 2½