Total No. of printed pages = 4

CSE 181405

11/8/22

Roll No. of candidate | | | | | | | | | | |

2022

B.Tech. 4th Semester End-Term Examination

GRAPH THEORY

(New Regulation) & (New Syllabus)

Full Marks – 70 Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer question No. 1 and any *four* from the rest.

1. Choose the most appropriate choice to answer the following: (10 × 1 = 10)

(i) A graph is
- (a) Always Connected
- (b) May have isolated nodes
- (c) Always a tree
- (d) None above

(ii) Tree is
- (a) A connected acyclic graph
- (b) Acyclic graph
- (c) Cyclic graph
- (d) None of above

(iii) Number of edges in a simple tree with N number of vertices is
- (a) N+1
- (b) N-1
- (c) N
- (d) None above

(iv) Spanning tree of a graph
- (a) must contain all vertices
- (b) must contain all edges
- (c) is always disconnected
- (d) None of above

(v) Number of edges in a graph with N number of vertices is N+3 means
- (a) Graph must be disconnected
- (b) Graph must have self-loop or parallel edges or cycles
- (c) It must be a tree
- (d) None of above

[Turn over

(vi) Maximum degree of a vertex in a connected simple graph having N vertices is

(a) N-1 (b) N

(c) N+1 (d) 2N

(vii) Number of number of vertices with odd degree in a connected simple graph must be

(a) Even (b) Odd

(c) Zero (d) None of above

(viii) What will be the chromatic number for an empty graph having n vertices?

(a) 0 (b) 1

(c) n (d) None above

(ix) Which of the following statement is true for a simple graph?

(a) Tree has no bridge

(b) Bridge can not be part of a cycle in a graph

(c) A graph having a bridge cannot have a cycle

(d) None of the above

(x) Which of the following statement is true for a simple graph?

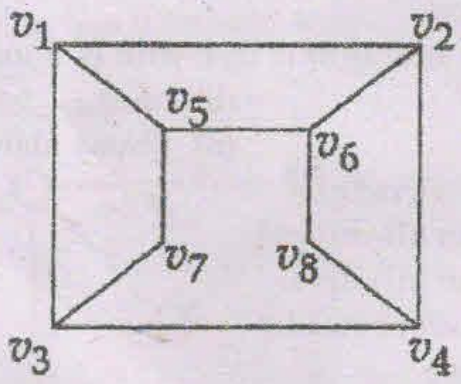
(a) Triangle is a bipartite graph

(b) Square is a bipartite graph

(c) Pentagon is a bipartite graph

(d) None of above

2. Consider the following graph and answer the following questions

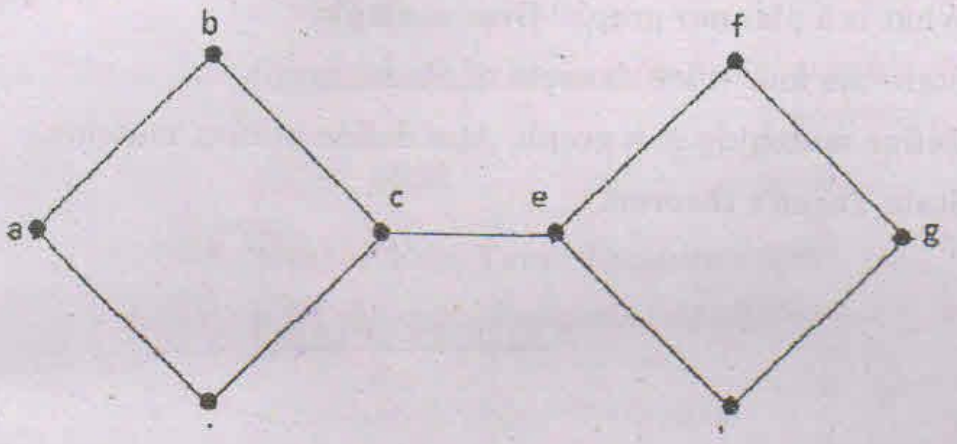


(a) Represent the graph using adjacency matrix representation (4)

(b) Compute degree of each vertex (3)

(c) Is the graph a bipartite graph? Justify your answer. (8)

3. Consider the following graph and answer each of the following questions with justification



(a) Find out each and every cut vertex and bridge that exist in the graph (if any exists) (4)

(b) Find out each and every vertex cut set that exist in the graph (if any exists) (3)

(c) What is a block? Identify all the blocks in the graph with justification (if any exists) (8)

4. (a) Define subgraph and Isomorphism (4)

(b) What is automorphism? Explain with an example. (3)

(c) Prove that

(i) Any two vertices in a tree can be connected by a unique simple path.

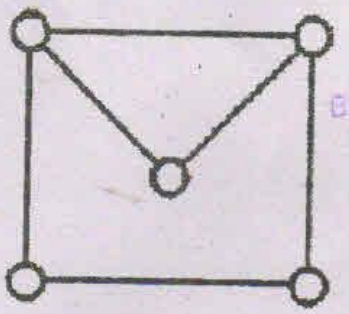
(ii) Every tree is a bipartite graph (4+4=8)

5. (a) How many maximum number of labelled trees are possible with 6 nodes (4)

(b) State the Menger's Theorem in graph theory. (3)

(c) Prove that a graph G is connected if and only if G has a spanning tree. (8)

6. Consider the following graph and answer the following questions:



(a) Does it contain any euler path and euler circuit? Justify (4)

(b) Does it contain any Hamilton path and Hamilton circuit? Justify. (3)

(c) Let G be a connected simple graph with n vertices with n greater than or equal to 3. Prove that, If the degree of each vertex is greater than or equal to n/2, then G has a Hamilton circuit. (8)

7. (a) What is a planner graph? Give example (4)

(b) State the four color theorem of planer graph (3)

(c) Define matching in a graph. Also define perfect matching. (4)

(d) State Turan's theorem. (4)