



Reg. No. : .....

Name : .....

**Eighth Semester B.Tech. Degree Examination, January 2018  
(2013 Scheme)  
13.805.2 : GRAPH THEORY (FR)**

Time : 3 Hours

Max. Marks : 100

**PART – A**

Answer **all** questions, **each** question carries **4** marks.

1. Prove that the number of vertices in a binary tree with 0 or 2 children for all nodes is always odd.
2. Draw all possible spanning trees for  $K_5$ .
3. Explain the steps involved in testing for planarity of graphs.
4. What are the difficulties encountered in the theory of sequential machine ?
5. What are the properties of a State Graph ?

**PART – B**

Answer **any one full** question from **each** Module, **each** question carries **20** marks.

**Module – I**

6. a) Define graph isomorphism and characterize graphs possessing 1-isomorphism and 2-isomorphism. 10  
b) Show the relationship between circuit matrix and incidence matrix of digraphs. 10
7. a) Prove that, in a tree with two or more vertices, there are at least two leaves. 10  
b) Prove that a connected planar graph  $G$  with  $n$  vertices and  $e$  edges has  $e - n + 2$  regions. 10

P.T.O.

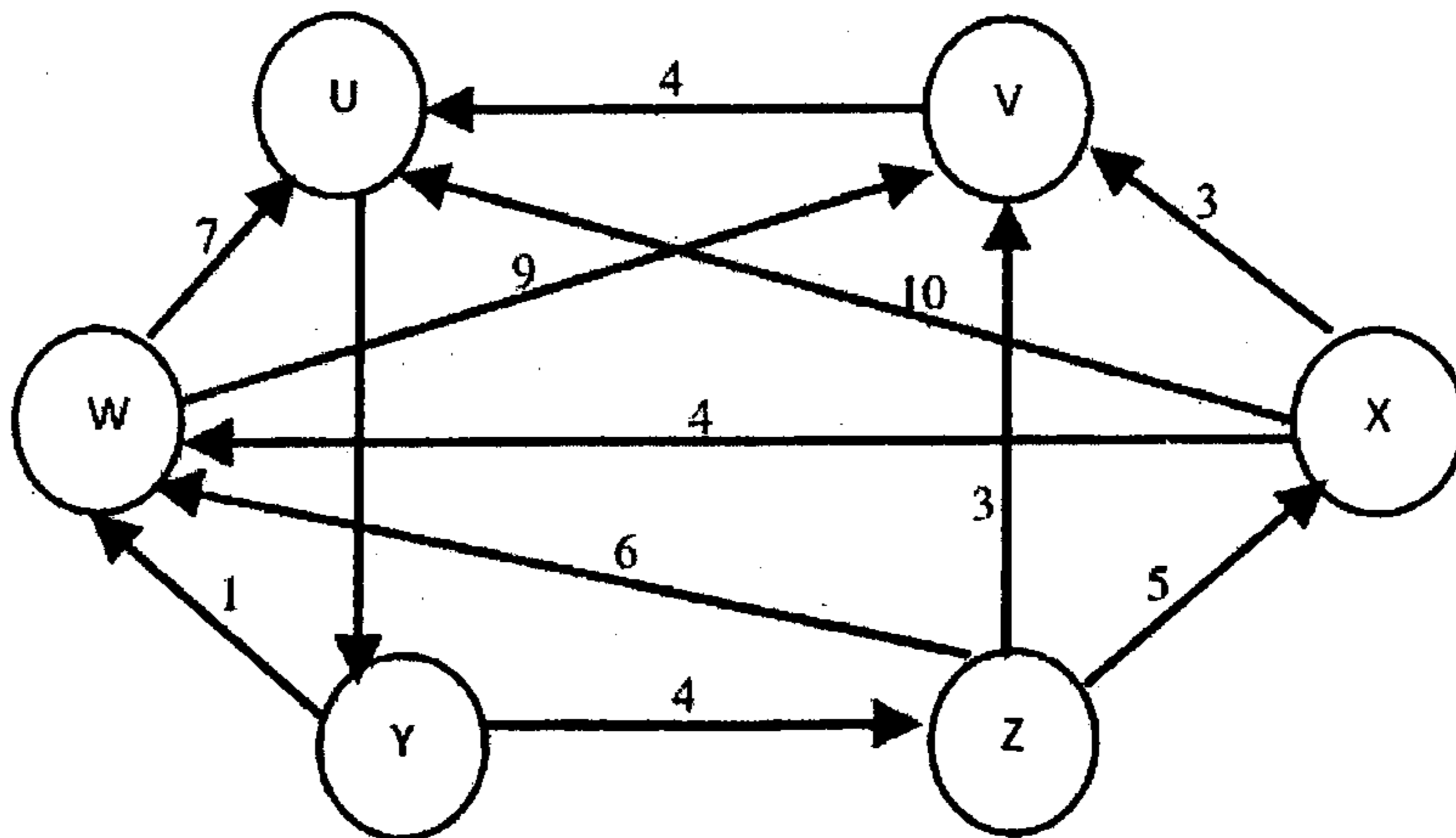


### Module – II

8. a) Prove that the largest number of edges in a planar graph is  $3n-6$ , where  $n$  is the number of vertices in the graph. 10
- b) Show that a connected graph  $G$  is an Euler graph if and only if all vertices are even degree. 10
9. a) Show that every simple connected planar graph  $G$  with less than 12 vertices must have a vertex of degree  $\leq 4$ . 10
- b) What is the longest circular sequence formed out of three symbols  $x, y$  and  $z$  such that no subsequence of four symbols is repeated. Give one such sequence. 10

### Module – III

10. a) With suitable example, explain the procedure to find a set of fundamental circuits in a given graph. 10
- b) Find the shortest path from vertex  $Z$  to all other vertices for the following graph. 10



11. a) Illustrate the search algorithm that can be employed to find the components or blocks in a graph, with an example. 10
- b) Given a connected graph  $G$ , derive the rank of the matrix that defines the graph within 2-isomorphism. 10



**Module - IV**

12. a) Find a graph that realizes the SC function  $F_{ab} = X_2X_3X_5X_7 + X_1X_3X_5X_7 + X_1X_5X_6X_8 + X_3X_7 + X_2X_4X_6X_8 + X_3X_4X_6X_7X_8 + X_5X_6X_7$ . **10**
- b) Illustrate the procedure to find the transmission matrix of an n-vertex contact network. **10**
13. a) State and prove the necessary and sufficient conditions for the (0, 1) matrix M to be a cut-set matrix. **8**
- b) Design a sequential machine to respond to an arbitrary input sequence of 0's and 1's. The machine should produce an output of 1 whenever there appears a set of four consecutive input bits of value greater than 9 in a serial 8-4-2-1 BCD code (the least significant bit comes to the machine first). Whenever the value of a four bit sequence is 9 or less, the output should be 0. **12**
-