Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 71691

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Seventh/Eighth Semester

Computer Science and Engineering

CS 6702 — GRAPH THEORY AND APPLICATIONS

(Common to Information Technology)

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

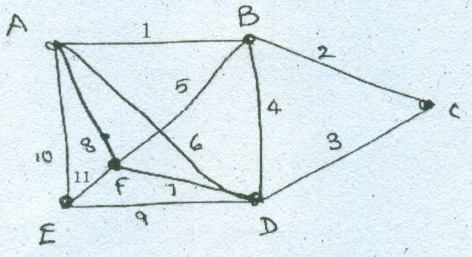
PART A — (10 × 2 = 20 marks)

1. Define Euler graph. Show that an Euler graph is connected except for any isolated vertices the graph may have.

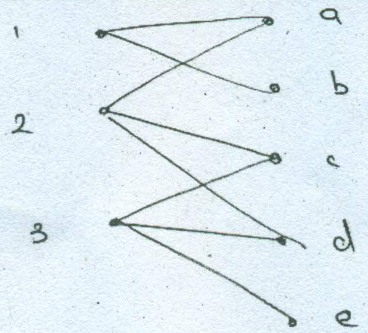
2. Can there be a path longer than a Hamiltonian path (if any) in a simple, connected, undirected graph? Why?

3. Define planar graphs.

4. Identify two spanning trees for the following graph :



5. Does the following graph have a maximal matching? Give reason.



6. Draw K_8 and K_9 and show that thickness of K_8 is 2 while thickness of K_9 is 3.

7. State the rule of sum, the first principle of counting.

8. Use Venn diagram to represent the following scenario :

If S : a set, C_1 = condition 1 and C2 – condition 2 satisfied by some elements of S, indicate on the diagram – S, $N(C_1)$, $N(C_2)$ $N(C_1, C_2)$ and $N(\overline{C_1}, \overline{C_2})$.

9. Give explanation for the following : Generating function for the no. of ways to have n cents in pennies and nickels $= (1 + x + x^2 + ...)(1 + x^5 + x^{10} + ...)$

10. Solve the recurrence relation $a_{n+1} - a_n = 3n^2 - n \quad n \geq 0 \quad a_0 = 3$.

PART B — (5 × 16 = 80 marks)

11. (a) Define the following terms :

(i) Walk

(ii) Euler path

(iii) Hamiltonian path

(iv) Subgraph

(v) Circuit

(vi) Complete graph (6)

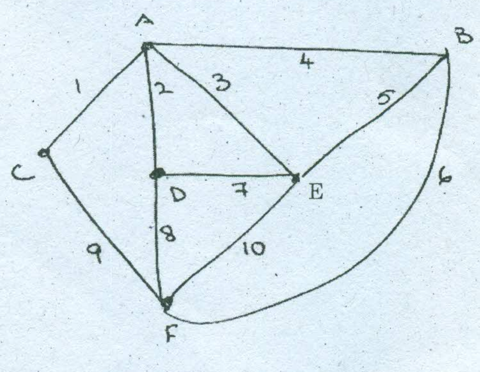
From the given graph draw the following :

(vii) Walk of length 6

(viii) Is this an Euler graph? Give reasons

(ix) Is there a Hamiltonian path for this graph? Give reasons

(x) Find atleast two complete subgraphs (10)



Or

(b) (i) List any five properties of trees. (6)

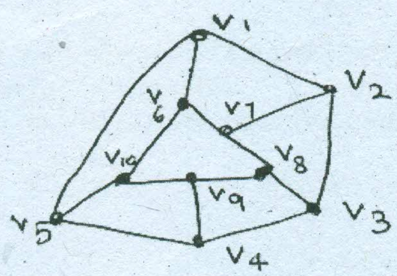
(ii) Define eccentricity of a vertex V in a tree T and give an example tree and its eccentricity from the root. (10)

12. (a) (i) Define spanning tree and give an example.

(ii) A farm has six walled plots full of water. The graph representation of it is given below. Use the concepts of spanning tree, cutsets appropriately to determine the following :

(1) How many walls will have to be broken so that all the water can be drained out?

(2) If only one plot was full of water and this had to be drained into all other plots, then how many walls need to be broken?



Or

(b) State the Eulers formula relating the number of vertices, edges and faces of a planar connected graph. Give two conditions for testing for planarity of a given graph. Give a sample graph that is planar and another that is non-planar.

13. (a) Describe the steps to find adjacency matrix and incidence matrix for a directed graph with a simple example.

Or

(b) Write a note on chromatic polynomials and their applications.

14. (a) In how many ways can the 26 letters of the alphabet be permuted so that the patterns car, dog, pun or byte occures? Use the principle of inclusion and exclusion for this.

Or

(b) When n balls numbered 1, 2, 3 ... n are taken in succession from a container, a rencontre occurs if m[th] ball withdrawn is numbered $m, 1 \le m \le n$.

Find the probability of getting

(i) no rencontres.

(ii) exactly one rencontre

(iii) Atleast one rencontre and

(iv) r rencontries $1 \le r \le n$. Show intermediate steps.

15. (a) If a_n is count of number of ways a sequence of 1s and 2s will sum to n, for $n \ge \theta$. Eg $a_3 = 3$ (i) 1, 1, 1 ; (ii) 1, 2, and (iii) 2, 1 sum up to 3.

Find and solve a sequence relation for a_n.

Or

(b) What are Ferrers diagrams? Describe how they are used to (i) represent integer partition (ii) Conjugate diagram or dual partitions (iii) self-conjugates (iv) representing bisections of two partition.