PART C — (1 × 15 = 15 marks)

16. (a) (i) Show that a Hamiltonian path is a spanning tree. (5)

(ii) Prove that in a tree every vertex of degree greater than one is a cut-vertex. (5)

(iii) Prove that a connected planar graph with n vertices and e edges has $e-n+2$ regions. (5)

Or

(b) (i) Solve the recurrence relation $F_n = 5F_{n-1} - 6F_{n-2}$ where $F_0 = 1$ and $F_1 = 4$. (8)

(ii) Solve the recurrence relation $a_n - 3a_{n-1} = 5(3^n)$ where $n \geq 1$ and $a_0 = 2$. (7)

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Reg. No. :

Question Paper Code : 52875

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Seventh/Eighth Semester

Computer Science and Engineering

CS 6702 — GRAPH THEORY AND APPLICATIONS

(Common to Information Technology)

(Regulation 2013)

Time : Three hours Maximum : 100 marks

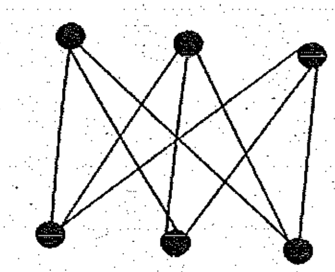
Answer ALL questions.

PART A — (10 × 2 = 20 marks)

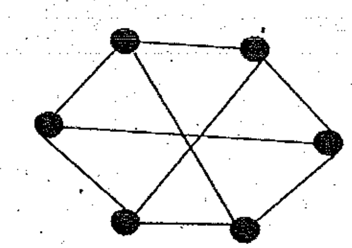
1. Define pendant vertex.

2. Verify that the two graphs (a) and (b) in the following figure are isomorphic. Mention the reasons for it.

(a)



(b)



3. What is meant by edge connectivity?

4. Give an example for planar graph.

5. Define maximal independent set.

6. Give an example for transitive relation.

7. In how many ways can the letters of the word APPLE be arranged?

8. In how many ways can a group of 5 men and 2 women be made out of a total of 7 men and 3 women?

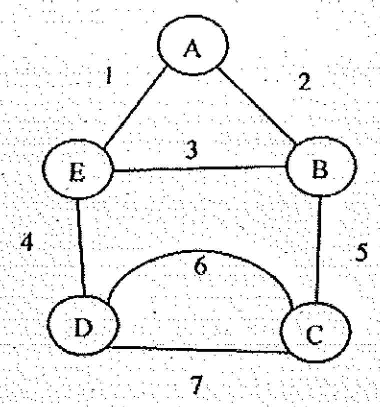
9. Find the generating functions for 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, ...

10. Find a recurrence relation and initial conditions for 1, 5, 17, 53, 161, 485.....

PART B — (5 × 13 = 65 marks)

11. (a) (i) Explain some of the applications of graphs. (7)

(ii) Write down the adjacency and incidence matrices for the following graph. (6)

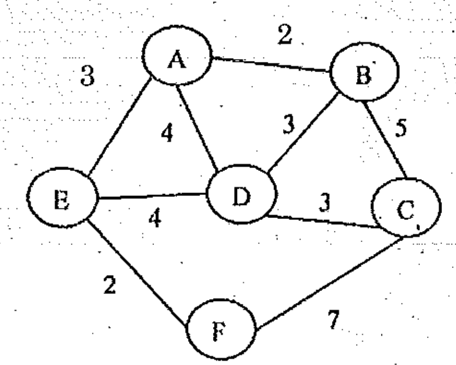


Or

(b) (i) List some of the properties of tree. (7)

(ii) Prove that a connected graph G is an Euler graph iff all vertices of G are of even degree. (6)

12. (a) (i) Find the minimum spanning tree for the following graph using Prim's algorithm. Explain it. (7)



(ii) Prove that the maximum flow in a network is equal to the minimum of capacities of all cut-sets. (6)

Or

(b) (i) Prove that the complete graph of five vertices is non-planar. (6)

(ii) List the properties of cut-set. (7)

13. (a) (i) With example, explain various types of digraphs. (6)

(ii) How will you find all maximal independent sets? Explain. (7)

Or

(b) (i) Why is chromatic polynomial? Explain. (6)

(ii) How is covering of a graph verified? Discuss about it. (7)

14. (a) (i) A box contains three white balls, four black balls and three red balls. Find the number of ways in which three balls can be drawn from the box so that at least one of the balls is black. (5)

(ii) How many ways are there to choose 3 people to receive Rs. 1,000 prize from a group of 9, assuming no one receives more than one prize? (5)

(iii) How many words can be formed by using all letters of the word 'BIHAR'? (3)

Or

(b) (i) In a group of 6 boys and 4 girls, four children are to be selected. In how many different ways can they be selected such that at least one boy should be there? (5)

(ii) How many arrangements can be made out of the letters of the word 'ENGINEERING'? (5)

(iii) In how many ways can three boys be seated on five chairs? (3)

15. (a) Find the coefficient of x^{2005} in the generating function $G(x)$

(i) $G(x) = (1-2x)^{5000}$ (4)

(ii) $G(x) = \dfrac{1}{1+3x}$ (4)

(iii) $G(x) = \dfrac{1}{(1+5x)^2}$. (5)

Or

(b) (i) Find the coefficient of x^{60} in $(x^8 + x^9 + x^{10} + ...)^7$. (5)

(ii) Find the recurrence relation for the sequence 3, 7, 11, 15, 19,.... (3)

(iii) Find the unique solution of the recurrence relation (5)

$$6a_n - 7a_{n-1} = 0,\ n \geq 1, a_3 = 343$$