Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code : 70396

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

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. What is meant by edge disjoint subgraphs?

2. Define pendant vertex.

3. List some of the applications of planar graph.

4. Give an example for spanning forest.

5. Define maximal independent set.

6. Mention the purpose of balanced digraph.

7. There are 6 people who will sit in a row but out of them Raja will always be left of Ram and Robert will always be right of Ram. In how many ways such arrangement can be done?

8. How many ways are there to select 3 males and 2 females out of 7 males and 5 females?

9. Find the generating function for the sequence 1,3,5,7,9.....

10. Check that $a_n = 2^n+1$ is a solution to the recurrence relation $a_n = 2a_{n-1}-1$ with $a_1=3$.

PART B — (5 × 13 = 65 marks)

11. (a) (i) How can you verify isomorphism. Explain it with suitable example. (7)

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

Or

    (b) (i) Prove that the number of vertices of odd degree in a graph is always even. (6)

    (ii) Write the application of Euler graph. (4)

    (iii) Define metric (3)

12. (a) (i) Compare vertex connectivity and edge connectivity. (3)

    (ii) How can you verify circuit correspondence? (3)

    (iii) With example, explain network flow problem. (7)

Or

    (b) (i) Discuss about I-isomorphic. (5)

    (ii) Write the properties of cutset. (5)

    (iii) Show that the Petersen's graph is non-planar. (3)

13. (a) (i) Prove that a graph with atleast one edge is 2–chromatic iff it has no circuits of odd length. (6)

    (ii) How will you find minimal dominating sets? Explain it. (7)

Or

    (b) (i) prove that a digraph G is an Euler digraph iff G is connected and is balanced. (7)

    (ii) With example. explain various binary relations. (6)

14. (a) (i) It is required to seat 5 men and 4 women in a row so that the women occupy the even places. How many such arrangements are possible? (6)

(ii) How many integers between I and 1000 (exclusive) are not divisible by 2, 3, 5, or 7? (7)

Or

(b) (i) Find the number of permutations of the letters of the word 'REMAINS' such that the vowels always occur in odd places. (7)

(ii) In how many ways can you put 7 letters into their respective envelopes such that exactly 3 go into the right envelope? (6)

15. (a) (i) Solve the recurrence relation $F_n=10F_{n-1} - 25F_{n-2}$ Where $F_0=3$ and $F_1=17$. (7)

(ii) Find the generating function for 1,3,3,1,0.0,0,0,... (6)

Or

(b) (i) Find the generating function for the sequence 0,0,0,1,2,3,4,5,6,7,.. (6)

(ii) With example. discuss exponential generating function. (7)

PART C — (1 × 15 = 15 marks)

16. (a) (i) The population of Mumbai city is 6,000,000 at the end of the year 2015. The number of immigrants is 20000 n at the end of year n. The population of the city increases at the rate of 5% per year. Use a recurrence relation to determine the population of the city at the end of 2025. (8)

(ii) Find the solution to the recurrence relation $a_n=3a_{n-1}+4a_{n-2}$ with initial terms $a_0=2$ and $a_1=3$. (7)

Or

(b) (i) Prove that any two simple connected graphs with n vertices, all of degree two, are isomorphic. (5)

(ii) Prove that any circuit in graph G must have atleast one edge in common with a chord set. (5)

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

_____

70396