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**Question Paper Code : 80305**

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Seventh Semester

Computer Science and Engineering

CS 6702 — GRAPH THEORY AND APPLICATIONS

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define walk, path and circuit in a graph.
2. What is meant by eccentricity?
3. Define 1–isomorphic and 2–isomorphic.
4. What are the applications of planar graph?
5. Define minimal dominating set and maximal independent set.
6. Find the chromatic number of a complete graph of $n$ vertices.
7. In how many different ways can the letters of the word 'LEADING' be arranged in such a way that the vowels always come together?
8. A committee including 3 boys and 4 girls is to be formed from a group of 10 boys and 12 girls. How many different committees can be formed from the group?
9. Define recurrence relation.
10. Define generating function.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Show that the maximum number of edges in a simple graph with n vertices is $n(n-1)/2$. (6)

(ii) Prove that if a graph has exactly two vertices of odd degree, there must be path joining these two vertices. (5)

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

Or

(b) (i) Mention some of the properties of tree. (5)

(ii) Prove that in any tree, there are atleast two pendant vertices. (5)

(iii) Show that a Hamiltonian path is a spanning tree. (6)

12. (a) (i) Explain max- flow min-cut theorem. (10)

(ii) Explain about Fundamental cut set and Fundamental circuit in a graph. (6)

Or

(b) (i) Prove that every connected graph has atleast one spanning tree. (6)

(ii) Prove the graphs $K_5$ and $K_{3,3}$ are non planar. (10)

13. (a) (i) Prove that every tree with two or more vertices is 2-chromatic. (5)

(ii) Prove that a graph of $n$ vertices is a complete graph iff its chromatic polynomial is

$$P_n(\lambda) = \lambda(\lambda-1)(\lambda-2)....(\lambda-n+1).$$ (6)

(iii) Prove that a covering $g$ of a graph is minimal iff $g$ contains no paths of length three or more. (5)

Or

(b) (i) Explain Euler digraph. (10)

(ii) Discuss about some types of digraph with suitable example. (6)

14. (a) (i) How many arrangements are there of all the vowels adjacent in SOCIOLOGICAL? (4)

(ii) Find the value of $n$ for the following : $2P(n, 2) + 50 = P(2n, 2)$. (5)



(iii) How many distinct four-digit integers can one make from the digits 1, 3, 3, 7, 7 and 8? (4)

(iv) In how many possible ways could a student answer a 10-question true-false test? (3)

Or

(b) (i) How many arrangements of the letters in MISSISSIPPI has no consecutive S's? (4)

(ii) A gym coach must select 11 seniors to play on a football team. If he can make his selection in 12,376 ways, how many seniors are eligible to play? (4)

(iii) How many permutations of size 3 can one produce with the letters m, r, a, f and t? (4)

(iv) Rama has two dozen each of $n$ different colored beads. If she can select 20 beads (with repetitions of colors allowed), in 230,230 ways, what is the value of $n$? (4)

15. (a) (i) Discuss about exponential generating function with an example. (10)

(ii) Find the unique solution of the recurrence relation $6a_n - 7a_{n-1} = 0, n \geq 1, a_3 = 343$. (6)

Or

(b) (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) Write short notes on summation operator. (8)

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