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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 — ($10 \times 2 = 20$ 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 — ($5 \times 16 = 80$ 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
- $$P_n(\lambda) = \lambda(\lambda-1)(\lambda-2)\dots(\lambda-n+1). \quad (6)$$
- (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 $6a_n - 7a_{n-1} = 0, n \geq 1, a_1 = 343$. (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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