

Roll No.

Total No. of Pages : 2

BT6/M11

8606

Graph Theory and Combinatorics

Paper : CSE-322

Time : Three Hours]

[Maximum marks : 100

Note :— Attempt **FIVE** questions in all, selecting at least **ONE** question from each unit.

UNIT—I

1. (a) Give definitions of separability and show with the help of examples that these are equivalent.
 - (b) (i) Prove that in a non-separable graph G , the set of edges incident on each vertex of G is a cut set.
 - (ii) Prove that a non-separable graph has a nullity $\mu = 1$ if and only if the graph is a circuit.
2. (a) Show that two graphs in Fig. 1 are isomorphic :

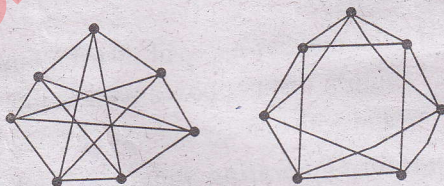


Fig. 1

- (b) Define Euler graph and mention theorems related to Euler graph.

UNIT—II

3. (a) Define and explain planar graphs.

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- (b) Explain the properties common to two graphs of Kuratowski. Also explain what do you understand by Kuratowski's two graphs.
4. Explain the following :
- Polya's counting theorem and Graph enumeration
 - Max-flow min-cut theorems.

UNIT—III

5. Write a program for generating all spanning trees. Also give the description of the algorithm. Name various minimal spanning tree algorithms.
6. What do you understand by depth-first search technique and its use ? Describe the depth-first search algorithm on a graph. How the graph $\bar{G}$ represented after depth first search implementation.

UNIT—IV

7. (a) What do you understand by recurrence relations ? Explain. Find the recurrence relations for :
- the number of ways to pick k objects with repetition from n -types.
 - the number $a_{n, m, k}$ of distributions of n -identical objects into k distinct boxes with at most four objects in a box and with exactly m -boxes having four objects.
- (b) Explain Generating functions and their role in solving combinatorial problems.
8. Write notes on :
- Error Correcting Codes
 - Inclusion-Exclusion Principle.