Roll No. ....   Total Pages : 6

11805/NJ

D–6/2111

DISCRETE MATHEMATICS AND GRAPH THEORY

Paper–505/503

(Common for Mc. & B.Sc. Hons in Math-Sem.–V)

Time Allowed : 3 Hours]   [Maximum Marks : 70

Note : The candidates are required to attempt **two** questions each from Sections A and B carrying 10 marks each and the entire Section C consisting of 10 short answer type questions carrying 3 marks each.

SECTION—A

1. (a) In a class of 60 boys, there are 45 boys who play cards and 30 boys play carrom. Find :   5

    (i)   How many boys play both games?

    (ii)   How many boys play cards only?

    (iii) How many boys play carrom only?

   (b) Show that if colours are used to paint 1000 houses, at least 112 houses will be of the same colour.   5

2. (a) In how many ways 5 boys and 3 girls be seated in a row so that no two girls are together? 5

   (b) In an examination, Yamini has to select 4 questions from each part. There are 6, 7 and

8 questions in Part I, Part II and Part III respectively. What is the number of possible combinations in which she can choose the questions? 5

3. For the recurrence relation : 10

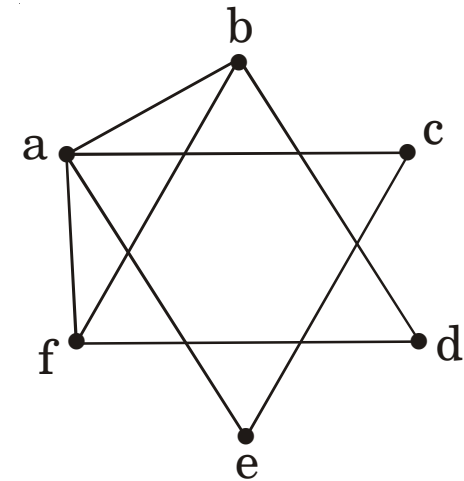$S_n - 6S_{n-1} + 8S_{n-2} = 0$ for $n \geq 2$ and $S_0 = 10$, $S_1 = 25$.

(i) Find the Generating function.

(ii) Find the sequence which satisfies it.

4. Solve the recurrence relation : 10

$S_n - 4S_{n-1} + 4S_{n-2} = 3n + 2^n$ with $S_0 = S_1 = 1$.
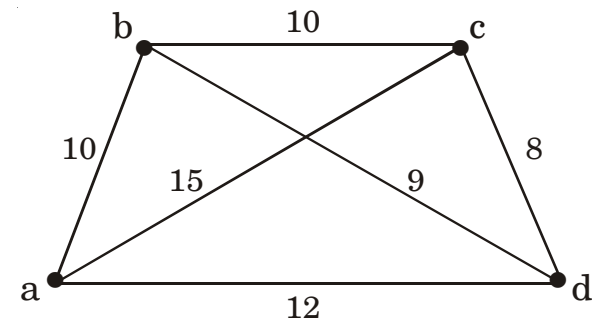
SECTION—B

5. State and prove Euler's formula on graphs and verify Euler's formula for the graph : 10
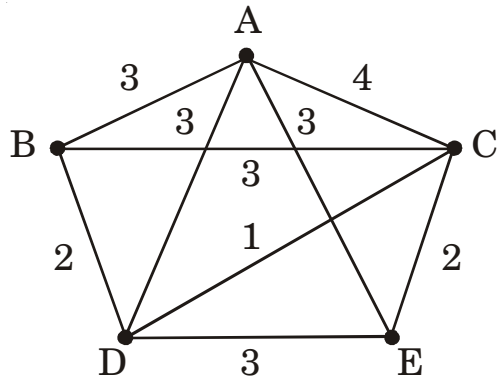

6. (a) Can a graph with Seven vertices be isomorphic to its complement? Justify. 5

(b) Find Hamiltonian circuit of minimal weight for the graph shown below : 5

7. Find minimal spanning tree of weighted graph using Prim's algorithm. 10

8. (a) Prove that a graph G is connected if and only if it has a spanning tree. 5

   (b) Prove that a tree with n vertices has at least two vertices of degree 1. (n ≥ 2). 5

SECTION—C

9. Write short notes on the following : 10×3=30

   (i) Define the Binary tree and complete Binary tree with example.

   (ii) Define the Euler path and Euler circuit in a graph.

   (iii) Let A and B be two finite sets such that n(A − B) = 15, n(A∪B) = 90, n(A∩B) = 30, find n(B).

   (iv) If $\angle n + 1 = 60 \angle n - 1$, find n.

   (v) Find r, if 10Pr = 2 × 9Pr.

   (vi) Verify that C(8, 4) + C(8, 3) = C(9,4).

   (vii) Define spanning tree and minimal spanning tree with examples.

   (viii) Define Bipartite graph and complete Bipartite graph with examples.

   (ix) Prove that in a graph the number of vertices of odd degree is even.

   (x) In how many ways can a student choose a programme of 5 courses if 9 courses are available and 2 courses are compulsory for every student?