DISCRETE MATHEMATICS—I

Paper-II
Semester-V

Time Allowed : 3 Hours] [Maximum Marks : 36

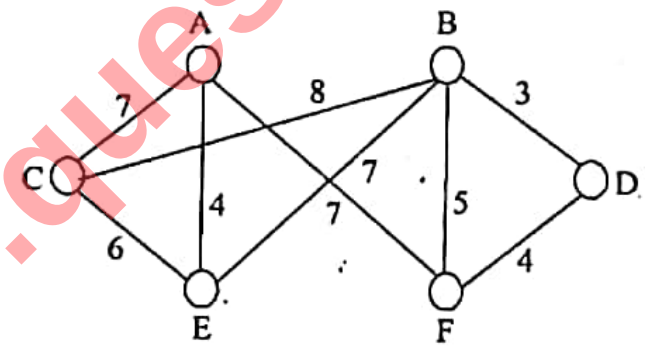
Note : The candidates are required to attempt two questions each from Sections A and B carrying 5½ marks each and the entire Section C consisting of 10 short answer type questions carring 1.4 mark each.

SECTION-A

1. (a) For any sets A d B, show that $(A \cup B)-(A \cap B)=(A-B)\cup(B-A)$ 2½
   (b) Prove that distinct equivalence classes of an equivalence relation on a set form a partition of that set. 3
2. (a) If R = {(a - b) : |a - b| = } and S = {(a, b) : a - b is even} are two relations on A = {1, 2, 3, 4}. Then draw diagraph of R and S. And show that $R^2 = S^2$. 2½
   (b) By the Principal of Mathematical Induction, prove that for each $n \in N : (n+3)^2 \leq 2^{n+3}$. 3
3. (a) Prove that for a bounded distributive lattice L, the complements are unique if they exist. 2½
   (b) Let D_4 and D_6 be two lattices. Draw the Hasse diagram of $D_4 \times D_6$. Is it a lattice ? Justify your answer. 3
4. (a) Find how many arrangements can be made with the letters of the word 'MATHEMATICS'. In how many of them :
   (i) Consonants occur together
   (ii) Vowels occur together
   (iii) Vowels do not occur together ? 2½
   (b) Find number of friends you must have to guarantee that at least five of them will have birthday in the same month. 3

SECTION-B

5. (a) Show that finite connected graph is Eulerian iff each vertex has even degree. 2½
   (b) Draw binary tree when In order and Post order traversal is given :
   In order : m k n j o l u s v q t p r
   Post order : m n k o u v s t q r p l j. 3
6. (a) Prove that graph G is connected iff it has a spanning tree. 2½
   (b) Find minimum spanning tree of weighted graph :



3

7. A salesman must travel from city to city to sell his product. The following table shows the distance (in km) between various cities :

To City → / From City ↓	A	B	C	D	E
A	0	40	24	30	200
B	40	0	25	300	30
C	24	25	0	26	26
D	30	300	26	0	40
E	200	30	26	40	0

8. (a) Show that $K_{3,3}$ satisfies the inequality $|E| \leq 3|V| - 6$ but is not planar. 5½
   (b) Is there is a simple graph G with six vertices of degree 1, 1, 3, 4, 6, 7 ? 2½ 3

SECTION-C

9. (a) Two dice are tossed once. Find the probability of getting 'an even number on the first die or total of 8'.
   (b) State and prove De-Morgan's law.
   (c) How many elements will the power set of the following set has
   A = {0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10} ?
   (d) Construct grammar for the language L = {aaaa, aabb, bbaa, bbbb}.
   (e) For a group photograph, 3 boys and 2 girls stand in a line in all possible ways. How many photos could be taken if each photo corresponds to each such arrangement ?
   (f) State and prove handshaking theorem.
   (g) Define Bipartite and complete bipartite graph.
   (h) Define minimum spaning tree and forest.
   (i) Give an example of a graph which is Euler but not Hamiltonian.
   (j) Show that there is one and only one path between every pair of vertices in a tree.

10x1.4=14