Roll No. | | | | | | | | | | | | **Total No. of Pages: 03**

Total No. of Questions: 07

M.Sc. (Mathematics) (Sem. – 4)

DISCRETE MATHEMATICS

Subject Code: MSM501-18

M Code: 77871

Date of Examination :15-12-2022

Time: 3 Hrs. **Max. Marks: 70**

INSTRUCTIONS TO CANDIDATES:

1. **SECTION-A is COMPULSORY consisting of FIVE questions carrying TWO marks each.**
2. **SECTION-B contains THREE questions carrying FIFTEEN marks each and students have to attempt any TWO questions.**
3. **SECTION-C contains THREE questions carrying FIFTEEN marks each and students have to attempt any TWO questions.**

SECTON-A

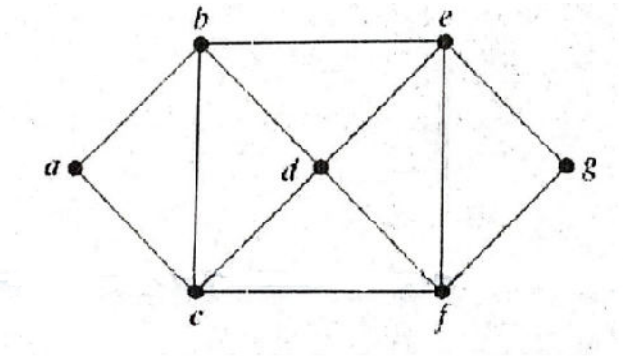
1. Answer the following:

   a) Show that $\neg(p \vee q)$ and $\neg p \wedge \neg q$ are logically equivalent.

   b) Show that the "divides" relation in the set of positive integers is not an equivalence relation.

   c) Define a Boolean algebra.

   d) Find the chromatic number of the following graph



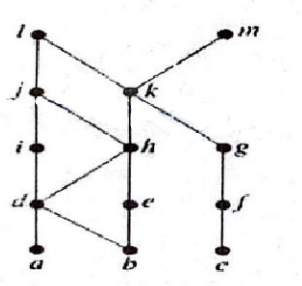
   e) Define an abelian group.

SECTION B

2. a) Solve the recurrence relation: $a_n - 6a_{n-1} + 9a_{n-2} = n3^n$

   b) Find the sequence whose generating function is $\frac{3-5z}{1-2z-3z^2}$

3. a) Answer these questions for the partial order represented by this Hasse diagram.



   i) Find the maximal and minimal elements.

   ii) Are there greatest and least elements? If yes, identify them.

   iii) Find all upper bounds and l.u.b. of {a, b, c}

   iv) Find all lower bounds and g.l.b. of {a, b, c}

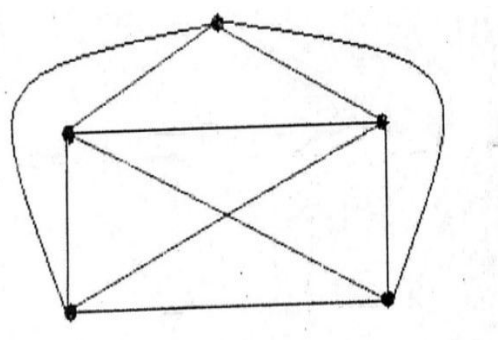
   b) State DeMorgan's Laws in Boolean algebra. Prove any one form of DeMorgan's Law.

4. a) Let A be the setoff integers and R be the relation defined on AxA by $(a,b)R\,(c,d)$ if $a + d = b + c$. Prove that R is an equivalence relation.

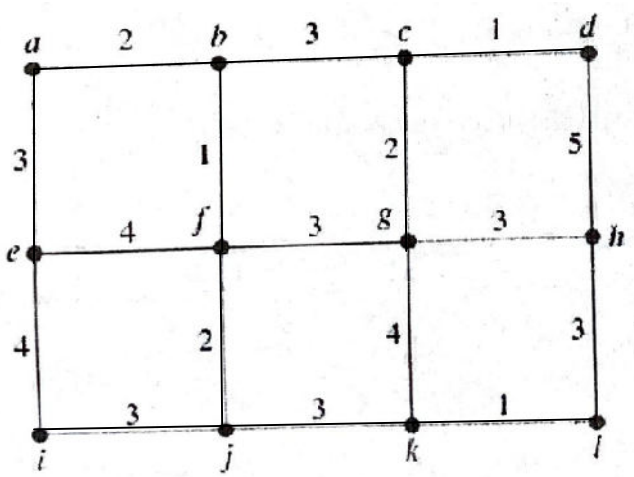
   b) In a distributive Lattice, prove that complement is unique.

SECTION C

5. a) Define Hamiltonian cycle. Determine whether the following graph is Hamiltonian? If yes, find:



b) Use Kruskal's algorithm to find a minimum spanning tree in the weighted graph shown below



6. a) Let G be a connected, simple and planer graph with p vertices, q edges and r regions, Derive the Euler formula connecting p, q and r.

   b) Express the encoding and decoding functions for the error-detecting code using matrices.

7. If the error-correcting code from this section is being used, how would you decode the following blocks? Expect an error that cannot be fixed with one of these.

   a) (1,0,0,0,1,1)

   b) (1,0,1,0,1,1)

   c) (0,1,1,1,1,0)

   d) (0,0,0,1,1,0)

   e) (1,0,0,0,0,1)

   f) (1,0,0,1,0,0)

NOTE : Disclosure of Identity by writing Mobile No. or Marking of passing request on any paper of Answer Sheet will lead to UMC against the Student.