Note:- The candidates are required to attempt Two question each from Section A,B, and and

Section is compulsory .

SECTION A

1. A) Prove that mod m relation is an equivalence relation

   b) Let $f: R \to R$ defined by $f(x) = x^2$. Prove that f is neither one-one nor onto.

2. a) There are 350 farmers in a large region. 260 farm beetroot, 100 farm yams, 70 farm radish, 40 farm beetroot and radish, 40 farm yams and radish, and 30 farm beetroot and yams. Let B, Y, and R denote the set of farms that farm beetroot, yams and radish respectively. Determine the number of farmers that farm beetroot, yams, and radish.

   b) Draw Hasse diagram of D_{100}, where D_n denotes the set of positive divisor of n.

3. A) Prove that D_n denotes the set of positive divisor of n is bounded distributive lattice.
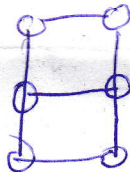
   b) State and prove uniqueness theorem of Lattice.

4. A) Let $A = \{1,2,3,4\}$ and relation on it $R = \{(a,b): |a-b| = 2\}$. Find transitive closure of R.
   b) A function f is invertible iff its is one –one and onto.   6×2 = 12

SECTION B

5. a) Find Minimal spaning tree of weighted graph using Prim's algorithim.
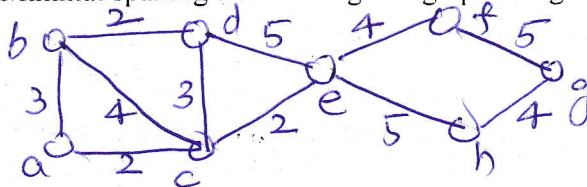
   b) Find number of Spanning Trees of given figure

6. If G is connected Graph and every vertex G is of even degree, then prove that G has an Euler Circuit.

7. a) Show that $K_{3,3}$ satisfies the inequality $|E| \le 3|V| - 6$ but is not planer..

   b) Prove that the maximum number of nodes of depth d of the binary tree is $2^d - 1$, where $d \ge 1$

8. Draw binary tree when Inorder and Post order traversal is given: 6×2

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*

b) Prove that simple graph with k-components and n vertices can have at the most of $\frac{(n-k)(n-k+1)}{2}$ edges.

SECTION-C

9)

a) State and prove commutativity law of sets.

b) Let f be a function $f(x, y) = x$. Show that f is computable.

c) Define Grammar and Turning Machine

d) Define Preorder, Post order, what is their application.

e) Give example of a Graph which is Euler circuit but not Hamiltonian cycle.

f) For a group photograph, 11 boys and 5 girls stand in a line in all possible ways. How many photos could be taken if each photo corresponds to each such arrangement.

g) Find how many arrangements can be made with the letters of the word 'SUCCESS'?

h) Discuss Three Pigeon hole principles.

8×2 = 16

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