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Discrete Mathematics -212

SEM-III

M.M. =75 | **Time: 3 hrs**

Note: Candidates are required to attempt **Five** questions in all by selecting at least **Two** questions each from the section A and B. Section C is compulsory. Non-Prog. Scientific Calculator is allowed.

Section-A

Q1: (a) If A and B have n elements in common. Show that $A \times B$ and $B \times A$ have n^2 elements in common.

(b) How many subsets can be formed from a set of n elements? How many of these will be proper and how many improper?

Q2: (a) Test the validity: Either I will get good marks or I will not graduate. If I did not graduate I will go to Australia. I get good marks. Thus, I would not go to Australia.

(b) Find the domain, range and inverse of the relation given by R:

$\left\{(x, y): y = x + \frac{10}{x}, where\ x, y \in N\ and\ x < 10\right\}$.

Q3: Prove by the principle of induction: $x^n - y^n$ is divisible be $x - y$.

Q4: (a) Let R be the relation on the set {0,1,2,3} containing the ordered pairs (0,1), (1,1), (1,2), (2,0), (2,2), and (3,0). What is the reflexive closure, symmetric closure and transitive closure of R?

(b) Partition $A = \{1,2,3,4,5,6,7\}$ with the minsets generated by $B_1 = \{2,4,6\}$ and $B_2 = \{1,4,5\}$ and also find out how many different subsets of A can you generate from B_1 and B_2?

Section-B

Q5: (a) Explain in detail the representation of the directed graphs and also give one example.

(b) Define Planner graph and regions. State and prove the properties for a graph to be planner graph.

Q6: (a) Define function and explain different types of functions.

(b) If $f: A \to B$ and $g: B \to C$ are two bijections, then show that $(fog)^{-1} = g^{-1}of^{-1}$.

Q7: (a) Define Complete Bipartite graph and give example. Find the number of edges if the graph G has 5 vertices, 2 of degree 3 and 3 of degree 2.

(b) An Undirected graph possesses an Eulerian path iff it is connected and has either zero or two vertices of odd degree.

Q8: (a) Prove that in a complete graph the number of edges is $\frac{n(n-1)}{2}$. How many vertices are there in a graph with 10 edges if each vertex has degree 2?

(b) Let G be a finite graph with n>1 vertices. Prove that G is tree iff it is minimally connected.

Section-C

Q9: (i) Define ordered pair and Cartesian product? (3)

(ii) Define union of two sets and give one example of each. (3)

(iii) Define totally ordered relation and give an example. (1)

(iv) Define Big-Theta Notation. (1)

(v) Define Ceiling function. (1)

(vi) Explain the travelling salesman problem. (3)

(vii) Explain the Kruskal's Algorithm for minimum spanning tree. (3)

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