Krishna Kanta Handiqui State Open University
MCA/M Sc IT 3rd Sem. Examination, 2015

Discrete Mathematics

Time : 3 Hrs. Full Marks : 80

1. Answer any five from the following questions : 5×2 = 10
   (a) If A = {3, 5, 7, 9}, B = {7, 8} find A – B and $(A - B)'$.
   (b) Construct truth table for
   $(p \vee q) \wedge q$
   (c) What is transitive relation? Give example.
   (d) What is simple graph? Give an example.
   (e) What is group? Give one example.
   (f) Define one-one and onto function.

2. Answer any three from the following questions : 4×3 = 12
   (a) If $a_n = n^2 + 2n + 1$ find $a_{11} - a_6$.
   (b) Prove that
   $(p \rightarrow q) \wedge (r \rightarrow q) \Leftrightarrow (p \vee r) \rightarrow q$
   (c) How many ways the letters can be arranged of the word 'BEAUTIFUL'
   (d) Consider the lattice
   L = {a, b} and (L, ≤)
   Prove that
   $a \leq b \Leftrightarrow a \wedge b = a$
   $\Leftrightarrow a \vee b = b$
   Where ∧ and ∨ oparations of meet and join respectively.

3. Answer any three from the following questions : 6×3 = 18
   (a) Explain the Kruskal algorithm or Prim's algorithm.
   (b) If (L, ≤) be a lattice in which ∧ and ∨ denote the operations prove that
   $(a \vee b) \wedge (a \vee c) \leq a \vee (b \wedge c)$

   (c) How many arrangements can be made with the letters 'MISSISIPI'? How many of them Vowels are together?
   (d) Prove that every tree has atleast two vertices of degree one or in a tree, there are atleast two pendant vertices.

4. Answer any four from the following questions : 10×4 = 40
   (a) Define groupoid, monoid, sub group. Prove that the union of two subgroups of (G, *) is a subgroup of (G, *) iff one is contained in the other.
   (b) Define function and relation. What are different kinds of relations. Give examples of each kind of relation.
   (c) A firm X makes the following declaration - a clerk from the firm who passes the final exam is the first attempt will be awarded a prize of Rs. 200. Five clerks A, B, C, D and E appeared in the examination and only A, B could pass. But the firm awards prizes not only to them but to C and D also. Is this action logically justified? E claims prize comparing C and D but the firm refues. Is this 'refused' logically justified? How should the statement be worded so that only A and B will be entitled for the prize.
   (d) Let A = {1, 2, 3, 4} and p(A) be the power set. Let ≤ be the inclusion relation on P(A). Draw the Hasse diagram.
   (e) Define isomorphism, homomorphism. Prove that a homomorphism ϕ from (G, *) onto $(\overline{G}, \triangle)$ with kernel K is an isomorphism iff K={e}.