KRISHNA KANTA HANDIQUI STATE OPEN UNIVERSITY

MCA 3rd Sem. Examination, 2014

Paper : 09

Discrete Mathematics

Time : 3 Hrs. Full Marks : 80

1. Answer any five from the following questions $2\times5 = 10$

   (a) If $A = \{1, 2, 3, 4\}$, $B = \{2, 4\}$ find $A - B$ and $(B - A)$

   (b) Construct truth table for

   $(p \wedge q) \vee q \rightarrow P$

   (c) Give an example of an equivalence relation and reflexive relation.

   (d) What is a multigraph? Give example.

   (e) Define poset. Give example.

   (f) Define Abelian group. Give an example with justification.

   (g) Define composition function. Find fof if $f(x) = (x + 1)^2$.

2. Answer any three from the following $3\times4 = 12$

   (a) If $a_n = n^3 + 1$ find $a_{12} - a_{11}$

   (b) Prove that

   $(p \rightarrow q) \wedge (r \rightarrow q) \Leftrightarrow (p \vee r) \rightarrow q$

   (c) How many words can be formed from the word 'TOTAL'?

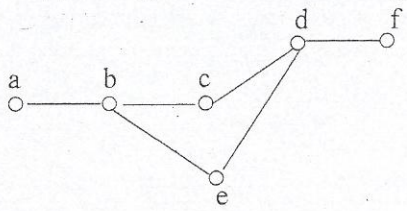
   (d) Consider the lattice $L = \{1, 2, 3, 4, 6, 12\}$, the divisions of 12 ordered by divisibility. Find

   (i) Lower bound and upper bound of L.

   (ii) The complement of 4.

   (iii) Is L a complemented lattice?

   (e) Construct a spanning tree for the following graph G



(48)

3. Answer any three from the following $6\times3 = 18$

   (a) If $(L, \leq)$ be a lattice in which $\wedge$ and $\vee$ denote the operations. Prove that for any a, b, $c \in L$

   $(a \wedge b) \vee (a \wedge c) \leq a \wedge (b \vee c)$

   (b) How many arrangements can be made with the letters BRAHMAPUTRA? In how many of them vowels are together?

   (c) Prove that a homomorphism ϕ from (G, x) onto $(\bar{G}, \Delta)$ with Kernel k is an isomorphism if and only if $k = \{e\}$.

   (d) Define an isolated vertex and pendant vertex with diagram.

   (e) Prove that every tree has alteast two vertices of degree one or in a tree, there are atleast two pendant vertices.

4. Answer any four from the following $10\times4 = 40$

   (a) If G be a group and a, $b \in G$, then prove the equation $a * x = b$ and $y * a = b$ have unique solutions.

   (b) Describe Kruskal's algorithm or Prim's algorithm with a suitable example.

   (c) A firm of Chartered Accountants makes the following declaration - An article clerk from the firm passing the final CA examination in the first attempt will be awarded a prize of Rs. 100. Five clerks P, Q, R, S, U appeared in the examination and only P, Q could pass. The firm awards prizes not only to them but to R and S also. Is this action logically justified? U claims the prize comparing himself with R and S but the firm refuses. Is this refused logically justified? How should the statement be worded so that only P and Q will be entitled for the prize.

   (d) Define function. What are the different kinds of functions? Show that the function $f(x, y) = x+y$ is primitive recursive. Use it to compute $f(2, 3)$.

   (e) Give the truth table of $\sim$, $\wedge$ $\vee$ and $\rightarrow$. Check if $(p \vee q) \leftrightarrow (q \vee p)$ and $\sim (p \wedge q) \leftrightarrow (\sim p) \vee (\sim q)$ are tautologies or not.

(48)