25/9/14

VCD Computer I-SYCS-Sem III-75 Marks-2 ½ hrs

Instruction: 1)All questions are compulsory.
2)Each question carry equal marks.

Q 1) Solve the following (any4) [20]

a) Prove that any two equivalence classes are either equal or disjoint.

b) Solve the recurrence relation $a_n=3a_{n-1}+2^{n-1}$, with $a_0=1$,using generating function.

c) Arrange the numbers 6,7,4,5,3 in ascending order using Bubble sorting algorithm.

d) Solve the recurrence relation $a_n=7a_{n-1}-10a_{n-2}$, with $a_0=5$, $a_1=16$.

e) Write a note on Tower of Hanoi.

f) Let a relation R defined on Z^+ as aRb iff a/b then prove that $(Z^+,/)$ is also poset.-

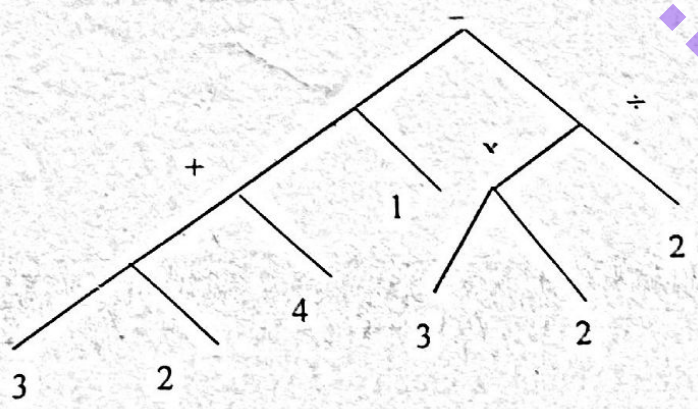
g) Define trasitive closure.
Let A={1,2,3,4}.Find the transitive closure of R whose matrix is given by

$$M_R=\begin{pmatrix}1&0&0&1&0\\0&0&1&1&0\\1&1&0&0&1\\0&1&0&1&0\\1&0&0&0&1\end{pmatrix}$$

h) Define the Composite relation .
Let A={1,2,3}, B={a,b,c}, C={x,y,z}. Let R={(1,b),(2,a),(2,c)} from A to B and S={(a,y),(b,x),(c,y),(c,z)} from B to C. Find SoR,M_{SoR} .Also verify $M_{SoR}=M_R O M_S$.

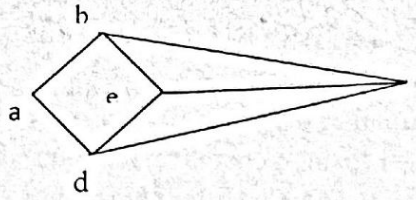
Q 2) Solve the following (any 4) [20]

a) Define a tree on 5 vertices with a suitable example.
Perform a preorder ,postorder and Inorder on the following tree .



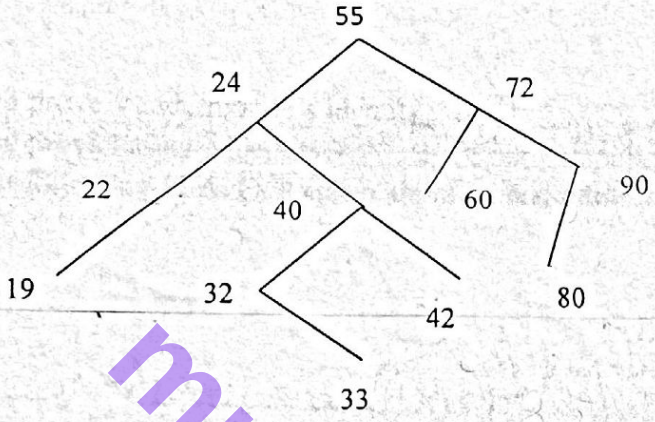
b) Define i) ordered rooted tree
ii) linked list representation using vertex and edge file.

c) Write the Breadth First Search algorithm. Apply it on the following graph starting with vertex 'a'



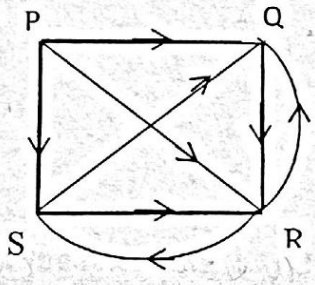
C)

d) Write an algorithm on deleting the value in binary seach tree. Use it to delete V=72.



e) i)Build a binary tree for a list
mathematics,geography,physics,geology,biology,chemistry,zoology.
ii)Define connected graph and regular graph with an example.

f) Find the Path matrix for the following graph using Warshall's algorithm



g) Define the term i) Binary tree ii) Complete binary tree iii) Extended binary tree.

h) i)Construct a tree of the algebraic expression (X+(Y-(X+Y))) x ((3÷(2x7))x4)
ii)Give the adjacency list and adjacency matrix of complete graph of 5 vertices.

Q 3) Solve the following (any 4) **[20]**

a) State the Inclusion – exclusion principle.
How many positive integers not exceeding 100 are divisible by 2,3 or 5?

b) State the Extended pigeonhole principle
Show that if seven colours are used to paint 60 bicycles , atleast 9 bicycles will be of the same colour.

c) State the sum and product rule.
How many bit string are there of length 8? Also find how many of them ends with two bits 00?

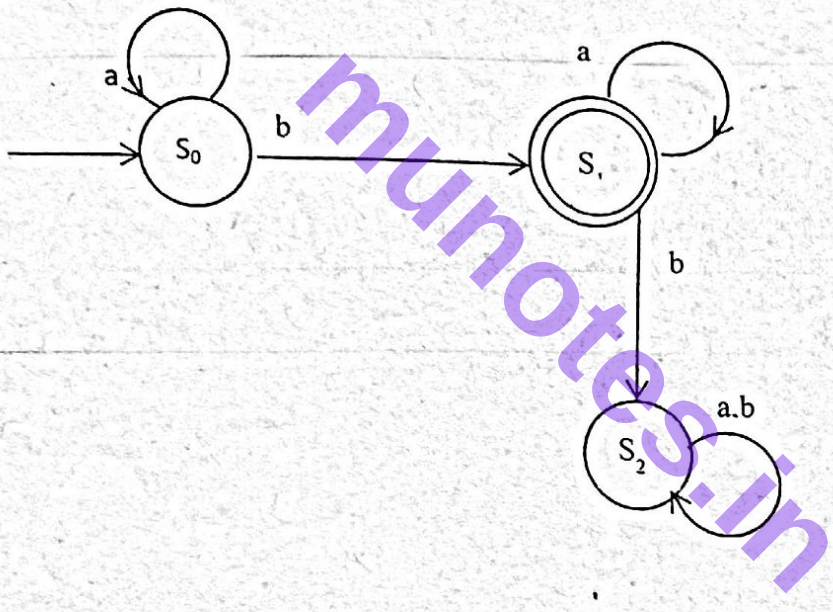
d) A family of 4 brothers and 3 sisters are to be seated for photograph in one row. In how many ways can they selected i)if all sisters are seat together.
ii) if no two sisters sit together

e) State the Binomial theorem . Use it to prove
i) $\sum_{k=0}^{n}\binom{n}{k}=2^n$ for non-negative integer n.
ii) $\sum_{k=0}^{n}\binom{n}{k}(-1)^k = 0$, for positive integer n.

f) State and prove Vandermonde's identity.

g) State and prove Pascal's identity.

h) Consider following FSA. Find states, input letters, initial state, accepting state, $f(s_1,b)$, write it's state table .



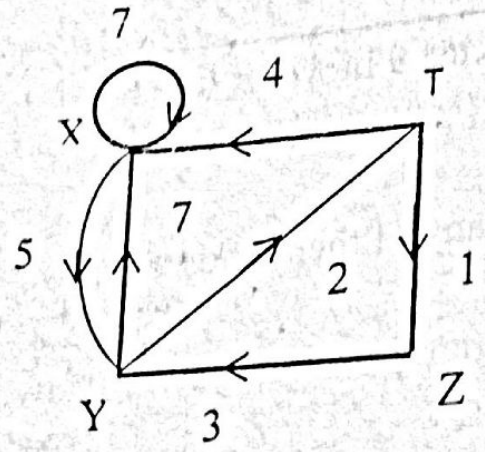
Q 4) Solve the following (any 3) **[15]**

a) Solve the non-homogenous recurrence relation $a_n = 5a_{n-1}-6a_{n-2}+7^n$.

b) Define the term i)Lattice ii)Distributive Lattice iii) Bounded Lattice.

c) Write a note on Binary operations on the graph.

d) Use Shortest-Path algorithm to find shortest path between the vertices of the following graph.



e) Define the term Grammer. Write a note on the types of Grammer.

f) Define a) Turning Machine b) finite state automata c)types of languages.