Additional Exam 2014 SYCS Sem III

VCD 230315 Computer I-SYCS-Sem III-75 Marks-2 ½ hrs Date - 23/3/15

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

Q 1) Solve the following (any 4) [20]

a) Find the explicit formula for a given recurrence relation $a_n=5a_{n-1}+3$,with $a_1=3$ using backtracking method.

b) Solve the recurrence relation $a_n=8a_{n-1}+10^{n-1}$, with $a_1=9$,using generating function.

c) Define trasitive closure.
Let A={1,2,3,4}.Let R and S be two relations defined on A. Find the trasitive closure of RUS,

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

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

e) Arrange the numbers 9,6,8,10,5 in ascending order using Bubble sorting algorithm.

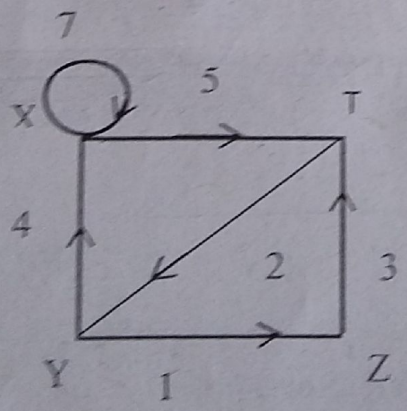
f) Solve the recurrence relation $a_n=3a_{n-1}+4a_{n-2}$, with $a_0=0$, $a_1=5$.

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

h) Define the Hasse diagram. Determine the Hasse diagram of R on A={1,2,3,4} whose $M_R=\begin{pmatrix}1&0&1&1&1\\0&1&1&1&1\\0&0&1&1&1\\0&0&0&1&0\\0&0&0&0&1\end{pmatrix}$

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

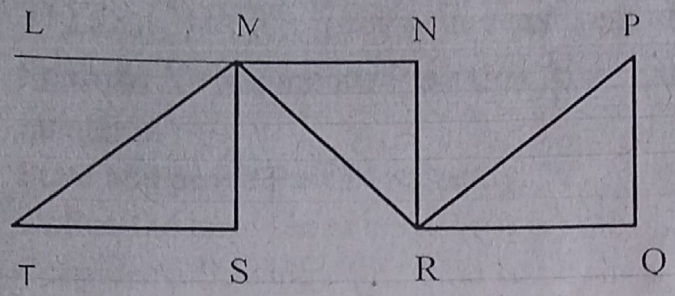
a) Use Shortest-Path algorithm to find shortest path between the vertices of the following graph.



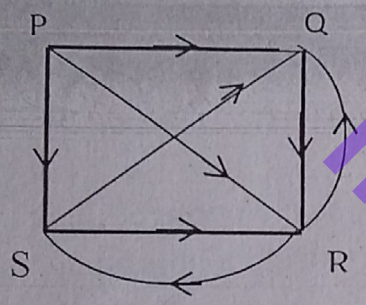
b) Define the term i) Binary tree ii) Complete binary tree iii) Extended binary tree.

c) i)Construct a tree of the algebraic expression $(X+(Y-(X+Y))) \times ((3\div(2x7))x4)$
ii)Give the adjacency list and adjacency matrix of complete graph of 5 vertices.

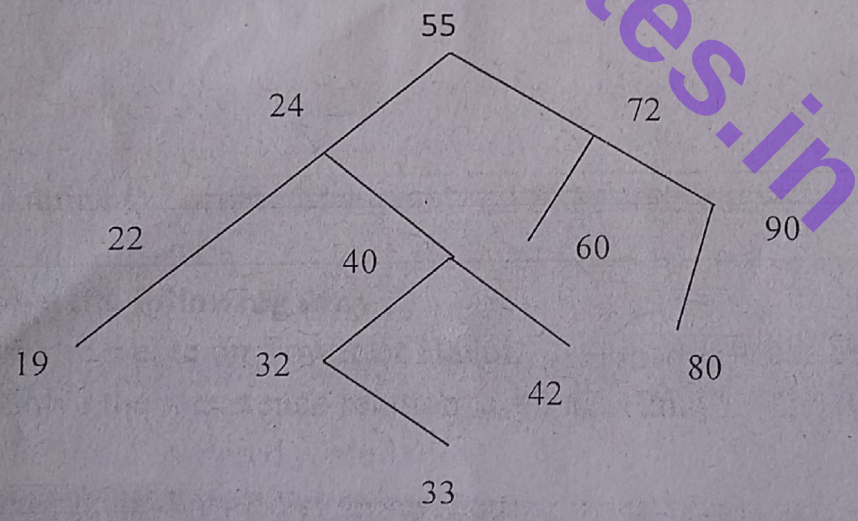
d) Write the Depth First Search algorithm. Apply it on the following graph starting with vertex 'M'



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



f) Write an algorithm on adding the value in binary seach tree. Use it to add V=36.



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

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

a) State the Inclusion – exclusion principle.
How many positive integers not exceeding 100 are divisible by 3 ,5 or 7?

b) 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?

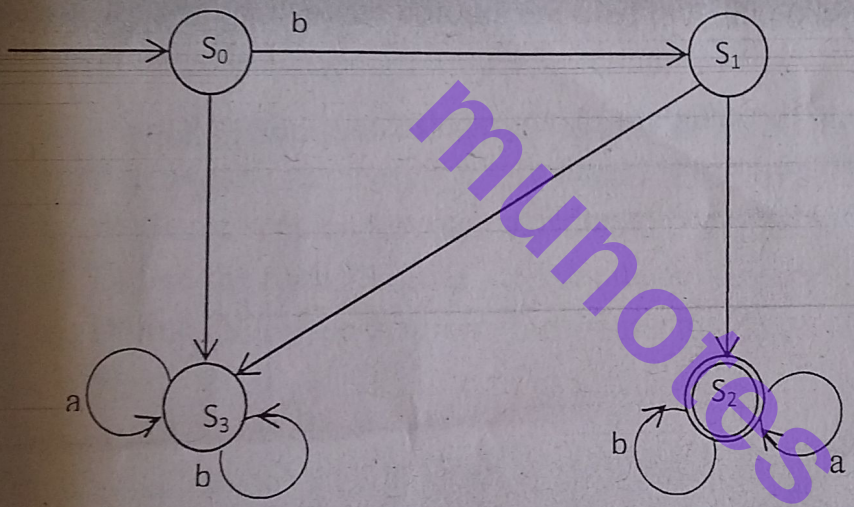
c) State the Binomial theorem . Use it to prove
i) $\sum_{k=o}^{n}\binom{n}{k}=2^n$ for non-negative integer n.
ii) $\sum_{k=o}^{n}\binom{n}{k}2^k=3^n$, for non-negative integer n.

d) State the Vandermonde's identity. Use it to prove $\binom{2n}{n} = \sum_{k=o}^{n}\binom{n}{k}^2$ for non-negative integer n.

e) State and prove Pascal's identity.

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

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



h) Define i) Turning Machine ii) finite state automata iii)types of languages.

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

a) Write a note on Tower of Hanoi.

b) Solve the recurrence relation $a_n=3\ a_{n-1}+2n$.

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