

Sub: Data Structures

Sem: IV

Duration: 1 hr.

Marks: 25

Instructions:

1. Attempt any **FIVE** questions
2. Assume suitable data wherever necessary and mention it clearly
3. Write answer to the point and correct
4. Each question carries FIVE marks

- Q. 1 Consider evaluating the expression tree on a machine with load-store architecture in which memory can be accessed only through load and store instructions. The variables a , b , c , d and e are initially stored in memory. The binary operators used in this expression tree can be evaluated by the machine only when the operands are in registers. The instructions produce result only in a register. Draw tree for expression $(a-b)+(e-(c+d))$. If no intermediate results can be stored in memory, what is the minimum number of registers needed to evaluate this expression? **(5 marks)**
- Q. 2 a) Show that maximum number of nodes in a binary tree of height h is $2^{h+1}-1$. A binary tree of height h with the maximum number of nodes is called a full binary tree. Assume, $h \geq 1$. **(2 marks)**
b) Suppose the following list of letters are inserted in order into an empty binary search tree: **(3 marks)**
J, R, D, G, T, E, M, H, P, A, F, Q
i) Find the tree T
ii) Find the inorder traversal of T
- Q. 3 a) Consider two binary operators ' \mid ' and ' $\mid \mid$ ' with the precedence of operator being lower than that of the operator. Operator \mid is right associative while operator $\mid \mid$ is left associative. Draw the sparse tree for expression $(7 \mid 3 \mid 4 \mid 3 \mid 2)$. **(3 marks)**
b) Consider the postfix expression P: 12, 7, 3, -, /, 2, 1, 5, +, *, +. Evaluate expression by using stack. **(2 marks)**
- Q. 4 Consider insertion of characters in empty linked list A, B, C, D, E, F. Assume these elements are stored using 10 memory locations. **(5 marks)**
i) Find the sequence of characters in the list.
ii) Suppose F and then C are deleted and then G are inserted at the beginning of list. Find the final structure.
- Q. 5 a) List the different types of linked list. Also, give advantages and disadvantages of each list. **(3 marks)**
b) Define the terms: level of tree, path, AVL tree, Complete binary tree. **(2 marks)**
- Q. 6 a) How do you implement two stacks using only one array. Your stack should not indicate an overflow unless every slot in an array is used? **(2 marks)**
b) Compare stack and queue data structure. Give name of one application for which stack is used. **(3 marks)**