Exam.Code:0929
Sub. Code: 33670

2125

B.E. (Electronics and Communication Engineering)

Fifth Semester

EC-507: Data Structure and Algorithms

Time allowed: 3 Hours Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Part.

x-x-x

Q1. (i) Which sorting algorithm is best if the list is already sorted? Why?

(ii) What is the difference between grounded header list and circular header list? Explain.

(iii) What is significance of garbage collection?

(iv) Discuss the time complexity of an algorithm using O notation.

(v) What is an AVL tree? **(5x2)**

Part-A

Q2. (a) What is a data structure? Differentiate between linear and non-linear data structures using suitable examples.

(b) Consider the following polynomial:

$$p(x,y,z) = 2xy^2z^3 + 3x^2yz^2 + 4xy^3z + 5x^2y^2 + 6y^3z + 7x^3z + 8xy^2z^5 + 9$$

(i) Rewrite the polynomial so that the terms are ordered lexicographically.

(ii) Assign values to an array LINK so that the linked list contains the ordered sequence of terms when the terms are stored in the lexicographical order in the linear arrays COEF, XEXP, YEXP and ZEXP with the with the HEAD node first. (2x5)

Q3. (a) Explain the concept of Deques. Consider following deque of characters where DEQUE is a circular array which is allocated six memory cells: **LEFT = 2, RIGHT = 5, DEQUE: ___, A, C, D, F, ___**

Describe the deque while the following operations take place:

(i) Two letters on the right are deleted.

(ii) K, L and M are added to the left of the deque.

(iii) One letter on the left is deleted.

(iv) R is added to the left of the deque.

(v) S and T are added to the right of the deque.

(b) What is the role of Recursion in Data Structures? Let 'a' and 'b' denote positive integers. Suppose a function Q is defined recursively as follows:

$$Q(a,b) = \begin{cases} 0 & if \quad a < b \\ Q(a-b,b) + 1 & if \quad b \leq a \end{cases}$$

(i) Find the value of $Q(2,3)$ and $Q(14,3)$.

(ii) What does this function do? Find $Q(5861,7)$. (2x5)

P.T.O.

Q4. (a) Consider the following arithmetic expressions, P1 and P2 written in postfix notation:

P1: 3, 1, +, 2, ↑, 7, 4, –, 2, *, +, 5

P2: 3, 5, +, 6, 4, –, *, 4, 1, –, 2, ↑, +

(i) Simulate and evaluate the arithmetic postfix expression, P1.

(ii) Translate, by inspection and hand, the postfix, P2 into infix notation and then evaluate.

(b) What is a linked list? Write an algorithm to insert and delete a node in singly linked list. **(2x5)**

Part-B

Q5. (a) Explain Breadth First Search algorithm using a suitable example.

(b) Suppose the following list of letters is inserted in order into an empty binary search tree:

J, R, D, G, T, E, M, H, P, A, F, Q.

(i) Find the final tree, T and (ii) Find the Inorder traversal of T. **(2x5)**

Q6. (a) Explain how the following list of numbers can be sorted using heap sort:

56, 23, 10, 99, 6, 19, 45, 45, 23.

(b) Sort the following elements using merge sort algorithm.

66, 33, 40, 22, 55, 88, 60, 11, 80, 20, 50, 44, 77, 30 **(2x5)**

Q7. (a) Write a short note on threaded binary tree.

(b) Define a hash function. Discuss some methods of obtaining hash functions. (2x5)

x-x-x