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10CS35

Third Semester B.E. Degree Examination, June/July 2017

Data Structures with C

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. List and define the criteria's that an algorithm must satisfy. Write an algorithm and its C code for selection sort. **(08 Marks)**

b. Define dynamic memory allocation. What are the benefits of dynamic memory allocation? Explain the memory allocation functions with example. **(07 Marks)**

c. Find the space complexity and time complexity for the following function. Assume 32-bit machine.

```
float rsum (float list [ ], int n)
{
  if (n)
     return rsum (list, n – 1) + list[n – 1];
  return 0;
}
```

(05 Marks)

2 a. Develop a structure to represent the planets in the solar system. Each planet has fields for the planet's name, its distance from sun, and the number of moons it has. Initialize items in each of the fields for the planets: Earth and Venus. **(04 Marks)**

b. Write a C program to add two polynomials. **(10 Marks)**

c. Give the ADT of sparse matrix. Write a function to transpose a sparsematrix. **(06 Marks)**

3 a. Define queue. List and define the different types of queues. Write the implementation of primitive operations of linear queue. **(08 Marks)**

b. Write a C program to evaluate a given postfix expression. **(08 Marks)**

c. Convert the following infix expression into postfix and prefix expression:

$(a + b) * d + e / (f + a * d) + c$ **(04 Marks)**

4 a. Write a C program to implement a stack using linked list. **(06 Marks)**

b. Write a function for inverting a simply linked list and a function for finding the length of a circular linked list. **(06 Marks)**

c. Give a node structure for sparse matrices. Write the linked representation for the following sparse matrix.

$$\begin{bmatrix} 2 & 0 & 0 & 0 \\ 4 & 0 & 0 & 3 \\ 0 & 0 & 0 & 0 \\ 8 & 0 & 0 & 1 \\ 0 & 0 & 6 & 0 \end{bmatrix}$$

(08 Marks)

PART – B

5 a. List and explain the different types of representation of trees with an example. **(06 Marks)**

b. Write the C implementation of inorder, preorder and postorder traversals. Illustrate with an example. **(08 Marks)**

c. Suppose that we have the following key values 7, 16, 49, 82, 5, 31, 6, 2, 44. Write out the max heap and min heap after each value is inserted into the heap. **(06 Marks)**

6 a. With an example, explain selection trees. **(06 Marks)**

b. With an example explain weighting rule for union and collapsing rule for find operation. **(08 Marks)**

c. Construct a binary search tree by using the following inorder and preorder traversals.
Inorder : BCAEDGHFI
Preorder : ABCDEFGHI **(06 Marks)**

7 a. Briefly explain the height-biased leftiest trees and weight-biased leftiest trees with example. **(08 Marks)**

b. What is binomial heap? Explain the steps involved in the deletion of min element from a binomial heap. **(08 Marks)**

c. List and define the different types of pairing heaps. Explain meld operation of pairing heaps with an example. **(04 Marks)**

8 a. What is an AVL tree? Write the algorithm to insert an item into AVL tree. Explain LR rotation with an example. **(10 Marks)**

b. Write short notes on the following:
i) Red-black trees
ii) Splay trees **(10 Marks)**

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