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10CS35

Third Semester B.E. Degree Examination, Dec. 2013/Jan. 2014
Data Structures with C

Time: 3 hrs.

Max. Marks: 100

- Note: 1. Answer FIVE full questions, selecting atleast TWO questions from each part.**
2. Missing data, if any, may be suitable assumed.

PART - A

1.
 - a. What is an ADT? Briefly explain the categories that classify the functions of a data type. Write an ADT for natural number. (10 Marks)
 - b. What is time complexity? Determine the time complexity of an iterative and recursive functions that adds n elements of the array using tabular method. (10 Marks)

2.
 - a. Develop a structure to represent planet in the solar system. Each planet has fields for the planet's name, its distance from the sun in miles and the number of moons it has. Write a program to read the data for each planet and store. Also print the name of the planet that has less distance from the sun. (08 Marks)
 - b. What is a polynomial? What is the degree of the polynomial? Write a function to add two polynomials? (08 Marks)
 - c. For the given sparse matrix A and its transpose, give the triplet representation. A is the given sparse matrix, and B will be its transpose.

$$A = \begin{bmatrix} 15 & 0 & 0 & 22 & 0 & -15 \\ 0 & 11 & 3 & 0 & 0 & 0 \\ 0 & 0 & 0 & -6 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 91 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -28 & 0 & 0 & 0 \end{bmatrix}$$

Fig. Q2(c) Sparse Matrix

(04 Marks)

3.
 - a. Define stack. Implement push and pop functions for stack using arrays. (08 Marks)
 - b. Implement addq and deleteq functions for the circular queue. (06 Marks)
 - c. Write the postfix form of the following expressions
 - i) $(a + b) * d + e / (f + a * d) + c$
 - ii) $((a / (b - c + d)) * (e - a) * c)$
 - iii) $a / b - c + d * e - a * c.$(06 Marks)

- 4 a. Write the different polynomial representation, with an example. (06 Marks)
 b. For the given sparse matrix write the diagrammatic linked list representation? (06 Marks)

$$A = \begin{bmatrix} 5 & 0 & 0 & 0 \\ 3 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 8 & 0 & 0 & 2 \\ 0 & 0 & 7 & 0 \end{bmatrix}$$

Fig. Q4(b) : 5 × 4 Sparse Matrix

- c. Define equivalence class. Write the linked list representation for the twelve polygons numbered 0 through 11 using the following pairs overlap?
 0 ≡ 4, 3 ≡ 1, 6 ≡ 10, 8 ≡ 9, 7 ≡ 4, 6 ≡ 8, 3 ≡ 5, 2 ≡ 11, 11 ≡ 0. (08 Marks)

PART – B

- 5 a. What is a tree? Explain (08 Marks)
 i) Root node
 ii) Degree
 iii) Siblings
 iv) Depth of a tree and give examples.
 b. What is a binary tree? State its properties? How it is represented using array and linked list, give example? (08 Marks)
 c. Define a max heap? Write a C function to insert an item into max heap? (04 Marks)
- 6 a. Explain the following, with an example (08 Marks)
 i) Selection trees
 ii) Forests and its traversals.
 b. Describe the binary search tree, with an example. Write a recursive function to search for a key value in a binary search tree. (08 Marks)
 c. Write the adjacency matrix and adjacency list for the following graph. (04 Marks)

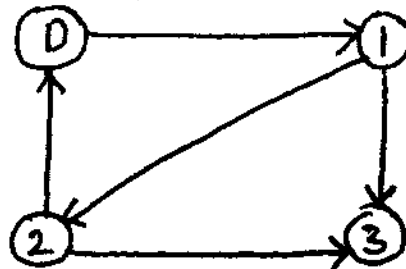


Fig. Q6(c) Directed graph

- 7 a. Briefly explain the following, with an example : (08 Marks)
 i) HBLT ii) WBLT.
 b. Write short notes on : (12 Marks)
 i) Priority queues
 ii) Binomial heaps
 iii) Fibonacci heaps.
- 8 a. What is an AVL tree? Write the algorithm to insert an item into AVL tree. (08 Marks)
 b. Explain the Red-Black-Tree with an example. State its properties. (08 Marks)
 c. What is a splay tree? Briefly explain the different types of splay trees. (04 Marks)