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10CS35

Third Semester B.E. Degree Examination, December 2011
Data Structures with C

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. What is an algorithm? Briefly explain the criteria that an algorithm must satisfy. **(08 Marks)**

b. Write a recursive function to implement binary search. **(08 Marks)**

c. Define 'Big Oh' notation. Show that $3n+2 = O(n)$ is correct. **(04 Marks)**

2 a. Develop a structure to represent planets in the solar system. Each planet has fields for the planets 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 the highest number of moons. **(08 Marks)**

b. For the given sparse matrix and its transpose, give the triplet representation using one dimensional array. a is the given sparse matrix, b will be its transpose.

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

(08 Marks)

c. Consider two polynomials $A(x) = 2x^{1000} + 1$ and $B(x) = x^4 + 10x^3 + 3x^2 + 1$, show diagrammatically how these two polynomials can be stored in a single 1-D array. Also give its C representation. **(04 Marks)**

3 a. Define stack. Give the C implementation of push and pop functions. Include check for empty and full conditions of stack. **(08 Marks)**

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

c. For the given circular queue shown in Fig.Q2(c), write the values of front and rear in the table after each specified operation is performed. Queue full/empty conditions must be considered. 0 - 7 indicate the array indices. **(04 Marks)**

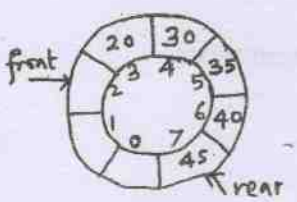

Fig.Q2(c)

Operation	Rear	Front
Insert 0		
Insert 10		
Insert 15		
delete		

4 a. Explain how a chain can be used to implement a queue. Write the functions to insert and delete elements from such a queue. **(08 Marks)**

b. Describe the doubly linked lists with advantages and disadvantages. Write a C function to delete a node from a doubly linked list. ptr is the pointer which points to the node to be deleted. Assume that there are nodes on either side of the node to be deleted. **(08 Marks)**

c. For the given sparse matrix, give the diagrammatic linked representation.

$$a = \begin{bmatrix} 0 & 1 & 2 \\ 3 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

(04 Marks)

PART – B

5 a. With reference to the Fig.Q5(a), answer the following:

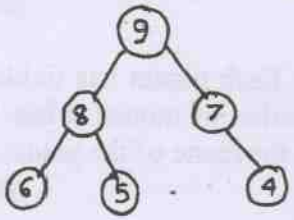

Fig.Q5(a)

i) Is it a binary tree?
ii) Is it a complete tree?
iii) Give the preorder traversal.
iv) Give the inorder traversal.
v) Give the postorder traversal
vi) Give the list notation (using pairs of round brackets).
vii) Where will be the left child of node 4 pointing to, if it is converted to a threaded b-tree?
viii) Is it a max heap?

(08 Marks)

b. Write the following C functions for
i) Counting the number of leaf nodes in a b-tree.
ii) Finding the inorder successor of a node in a threaded b-tree. **(08 Marks)**

c. Show that for any non-empty b-tree T, if n_0 is the number of leaf nodes and n_2 is the number of nodes of degree 2, then $n_0 = n_2 + 1$. **(04 Marks)**

6 a. Explain the following with an example:
i) Forest ii) Graph iii) Winner tree. **(08 Marks)**

b. Describe the binary search tree with an example. Write a iterative function to search for a key value in a binary search tree. **(08 Marks)**

c. Construct the b-tree from the given traversals:
Preorder : ABDCEF
Inorder : BDAEFC
Postorder : DBFECA **(04 Marks)**

7 a. Briefly explain the following with examples:
i) HBLT ii) WBLT **(08 Marks)**

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

c. Define Fibonacci heap. Briefly explain the different types. **(04 Marks)**

8 a. Describe the following with an example eah:
i) height balanced trees ii) Optimal bst **(08 Marks)**

b. Explain the Red-black tree. State its properties. **(08 Marks)**

c. What is a splay tree? Briefly explain the different types of splay trees. **(04 Marks)**

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