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Reg. No.....10.....

Name.....

B.TECH. DEGREE EXAMINATION, APRIL 2011

Fourth Semester

Branch : Computer Science and Engineering

DATA STRUCTURES AND PROGRAMMING METHODOLOGIES (R)

(Regular/Improvement/Supplementary)

Time : Three Hours

Maximum : 100 Marks

Part A

Answer **all** questions.

Each question carries 4 marks

1. Briefly explain the phases in the process of creating a program.
2. Define "space complexity of an algorithm". Why are computer scientists interested in it?
3. Write a function to push an item into a stack which is implemented using an array of size n .
4. Compare and contrast array implementations of linear queue and circular queue.
5. Give a recursive procedure for making a copy of a singly linked list whose pointer to the head is given.
6. Write a function to count the number of nodes in a singly linked list whose pointer to the head node is given.
7. Define data structure Tree. Give three differences between Tree and Binary Tree.
8. Explain any two methods for representing graphs in programs.
9. What do you mean by External Sorting? Give an example. Why are most of the internal sorting algorithms not suited for external sorting?
10. Determine the number of comparisons made while searching for the numbers 10 and 17, using binary search in {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16}

(10 × 4 = 40 marks)

Part B

Answer **all** questions.

Each full question carries 12 marks.

11. Give a recursive algorithm for the Tower of Hanoi problem and derive its time complexity.

Or

Turn over

12. Derive the average case time complexity of Sequential Search. Define Average, Best and Worst case time complexities. How are they computed generally?
13. Explain the row-major and column-major representation of 2D and 3D arrays. For row-major representation explain how the address of a particular element is computed.

Or

14. Give codes/pseudo-codes for converting an infix expression into postfix form, and evaluating a postfix expression.
15. A list of items is maintained as a doubly linked list and a pointer to the first node is given. Time :
Write codes for
 - (a) Inserting a new item at the n -th position in the list
 - (b) Deleting the n -th item
 - (c) Traversing the list

Or

16. Explain the implementation of stack using linked lists. Compare it with the implementation using arrays.
17. Write and explain a program to implement Binary Tree using array. Also, implement methods for inorder, preorder and post order traversals.

Or

18. Explain how sets are implemented using trees. Give algorithms to
 - (a) Check membership of an element in the set
 - (b) Compute the union of two sets
19. Give and explain Merge Sort algorithm. Trace its working with a sample input set of 10 unsorted numbers.

Or

20. Give and explain Quick Sort algorithm. Show that it shows its worst case performance (with respect to time) when the input set is already sorted.

(5 × 12 = 60 marks)