

**B.Tech Odd Semester (CBCS) Exam.,
December—2016**

COMPUTER SCIENCE AND ENGINEERING

(3rd Semester)

Course No. : CSECC-01

(Data Structure)

Full Marks : 50

Pass Marks : 15

Time : 2 hours

Note : 1. Answer any **five** questions.

2. Begin each answer in a new page.

3. Answer parts of a question at a place.

4. Assume reasonable data wherever required.

5. The figures in the margin indicate full marks for the questions.

1. (a) What is time complexity of each of the following tasks? {Choose from $O(1)$, $O(\log_2 n)$, $O(n)$, $O(n \log_2 n)$, $O(n^2)$, $O(2n)$; each order may appear more than once} : 5
- (i) Popping an item off a stack containing n items

(ii) Using quicksort to sort an array of n integers, in the worst case

(iii) Inserting a single item into a binary search tree containing n items, in the average case

(iv) Performing a bubble sort on an array of n integers, in the worst case

(v) Displaying all n elements in a sorted linked list

(b) What is recursion? Write a program in C to find factorial of a number using recursion. Briefly explain the program's time complexity as well. 1+3+1=5

2. (a) Which data structure is used to perform function calls in the memory? Why is heap needed for memory allocation? 2+3=5

(b) Write a program in C to find the index of the largest integer data items in an array containing 10 data items. 5

3. (a) Explain singly linked list in detail. 5

(b) Write the subroutines for a singly linked list : 5

(i) To insert a node in the middle

(ii) To delete a node from the middle

(3)

4. (a) Write an algorithm to evaluate the following postfix expression as your input : 5
a b + c d + *f
- (b) What are circular queues? Write down routines for inserting and deleting elements from a circular queue implemented using arrays. 5
5. (a) What is binary search tree (BST)? Make a BST for the following sequence of numbers :
45, 36, 76, 23, 89, 115, 98, 39,
41, 56, 69, 48
Traverse the tree in preorder, inorder and postorder. $1\frac{1}{2}+1\frac{1}{2}+2=5$
- (b) How do you rotate a binary tree? Explain right and left rotations with the help of an example. 5
6. (a) Describe insertion sort with a proper algorithm taking a suitable example. What is the complexity of insertion sort in the worst case? 6
- (b) How will you represent a max-heap sequentially? Explain with an example. 4
7. (a) Which are the two standard ways of traversing a graph? Explain them with an example of each. 5

(4)

- (b) What is quicksort? Sort the following array using quicksort method : 5
24 56 47 35 10 90 82 31
(Show all the steps.)
8. (a) How can stacks be used to check whether an expression is correctly parenthesized or not? 5
For e.g. (()) is well formed but (() or)() is not.
- (b) The following values are to be stored in a hash table :
25, 42, 96, 101, 102, 162, 197
Describe how the values are hashed by using division method of hasing with a table size of 7. Use chaining as the method of collision resolution. 5
