AUTUMN END SEMESTER EXAMINATION-2014

3rd Semester B.Tech & B.Tech Dual Degree

DATA STRUCTURES & ALGORITHMS CS-2001/CS-301

(Regular-2013 & Back of Previous Admitted Batches)

Full Marks: 60 **Time: 3 Hours**

Answer any SIX questions including Question No.1 which is compulsory.

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable and all parts of a question should be answered at one place only.

1. a) If you are using C language to implement the heterogeneous linked list, what pointer type will you use? [2 × 10]

   b) Difference between calloc and malloc.

   c) Arrange the following functions of time complexity in ascending order:

   n^3 , $\log_2 n$, $n \lg n$, n, $\log_{10} n$, n^2

   d) Minimum number of queues needed to implement the priority queue is _____.

   e) What is the significant difference between ARRAY and STACK?

   f) What is the data structures used to perform recursion. Justify your answer with example?

   g) Tell how to check whether a linked list is circular?

   h) Convert the expression ((A + B) * C – (D – E) ^ (F + G)) to equivalent Prefix notations.

   i) The sequence 23; 17; 14; 6; 13; 10; 1; 5; 4; 12 is a max-heap or not.

   j) What is mean by d-queue?

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2. a) Discuss the advantages, if any of a two-way list over a one-way list for each of the following operations. [4
   i) Traversing the list to process each node
   ii) Deleting a node whose location LOC is given
   iii) Searching an unsorted list for a given element ITEM
   iv) Searching a sorted list for a given element ITEM
   v) Inserting a node before the node with a given location LOC
   vi) Inserting a node after the node with a given location LOC

   b) Suppose LIST is a header circular list in memory. Write an algorithm which deletes the last node from LIST. [4

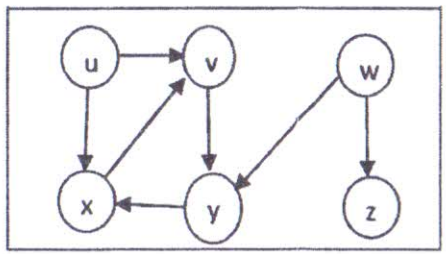
3. a) Write an algorithm to reverse a linked list. [4

   b) Write an algorithm to find n-th element from the tail. [4

4. a) Compare different types of queue. Write a function to delete elements in circular queue. [4

   b) Explain how we can efficiently represent a sparse matrix using two dimensional array. How we can transpose the sparse matrix using that two dimensional array? [4

5. a) [4



Show all the steps to find Depth first forest for the above graph.

   b) Explain the operation of HEAPSORT on the array A=< 5, 13, 2, 25, 7, 17, 20, 8, 4>. [4

6. a) Sort the following numbers in ascending order using Merge Sort technique. [4

   <6, 7, 5, 8, 3, 9, 2, 10, 1, 4, 6>

   b) Insert the following nodes in AVL Tree. [4

   <55, 66, 77, 15, 11, 33, 22, 35, 25, 44, 88, 99>

7. Write short note. [2+2+2+2

   a) BFS and DFS

   b) Time and space complexity

   c) Compare merge sort and quick sort

   d) Linear and non-linear data structures

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