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Third Semester B.E. Degree Examination, July/August 2021
Data Structures and Applications

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions.

1   a. Write the drawback of static memory allocation. Explain in detail the different functions of dynamic memory allocation.   **(08 Marks)**
   b. Write a program to search for key element in an array using binary search.   **(07 Marks)**
   c. Write the difference between structure and union.   **(05 Marks)**

2   a. Write a program to sort integers in increasing order using selection sort algorithm. **(06 Marks)**
   b. Write a function: (i) to find out the length of the string   (ii) string concatenation, without using built-in function.   **(08 Marks)**
   c. Write a program to search for an element in the sparse matrix.   **(06 Marks)**

3   a. What is stack? Write a program to implement push, pop and display operations for stacks using arrays.   **(08 Marks)**
   b. Convert the following infix expression to post fix expression:
     (i) $((A + (B - C) * D) \wedge E + F)$ (ii) $X\$Y\$Z - M + N + P/Q$ **(06 Marks)**
   c. Write a program to evaluate the postfix expression.   **(06 Marks)**

4   a. Explain the drawback of ordinary queue. Write a program to implement push, pop and display operations for circular queue using array.   **(08 Marks)**
   b. Write a recursive program to find out the GCD of two numbers.   **(05 Marks)**
   c. What is double ended queue? Write a program to implement the same with required functions.   **(07 Marks)**

5   a. Write a program to implement queue using singly linked list.   **(08 Marks)**
   b. Write a function to search for key element in a list using Singly Linked List.   **(06 Marks)**
   c. Write a function to delete a node based on information field using doubly Linked List.   **(06 Marks)**

6   a. Write a function to count the number of nodes in the List.   **(04 Marks)**
   b. Write a function to perform the following using circular doubly Linked List with header node.
     (i)   insert_front $\rightarrow$ insert element at front end
     (ii) delete_rear $\rightarrow$ delete element from rear end   **(08 Marks)**
   c. Write a function to add two polynomial using Linked List.   **(08 Marks)**

7   a. Explain the following with suitable example:
     (i)   Binary tree
     (ii)   Binary search tree
     (iii) Complete binary tree
     (iv) Skewed tree   **(08 Marks)**

   b.   Construct a tree using the given tree traversals:
       in-order : GDHBAEICF
       post-order : GHDBIEFCA   **(04 Marks)**
   c.   Write a function to create and search for an element in binary search tree.   **(08 Marks)**

8   a.   Write a program to insert an element in to binary tree.   **(08 Marks)**
      b.   Write a function to traverse the tree using
          (i)   pre-order
          (ii)   post-order
          (iii) in-order traversal   **(06 Marks)**
      c.   Explain Threaded Binary Tree in detail.   **(06 Marks)**

9   a.   Explain the different functions for file operations.   **(06 Marks)**
      b.   Write a program to sort the array elements using radix sort. Show tracing to sort the given
          array elements increasing order using radix sort. 52, 43, 24, 67, 78, 96, 81, 63, 27. **(08 Marks)**
      c.   Write a function to sort the array elements in increasing order using insertion sort. **(06 Marks)**

10 a.   Write a program to print the reachable nodes of a graph from the source node using BFS
        method.   **(06 Marks)**
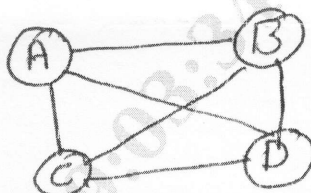   b.   Write the adjacency matrix and adjacency. List representation for the given graph in
        Fig.Q10(b).

Fig.Q10(b)   **(06 Marks)**
      c.   Explain hashing in detail.   **(08 Marks)**

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