

## MANIPAL UNIVERSITY

THIRD SEMESTER B.S. (ENGG.) DEGREE EXAMINATION – MAY/JUNE 2014

SUBJECT: DATA STRUCTURES (CS 231)

(BRANCH: COMP./C.SCIENCE)

Thursday, May 29, 2014

Time: 10:00 – 13:00 Hrs.

Max. Marks: 100

✍ Answer any FIVE full questions.

✍ All programs/ functions should be well documented

✍ Missing data if any, may be suitably assumed.

1A. What is recursion? Explain with syntax. Write recursive function to find the  $N^{\text{th}}$  Fibonacci number.

1B. Define the term time complexity. Write an algorithm for finding the sum of N integers and compute its time complexity.

1C. Write an algorithm to convert an infix expression to prefix expression.

(6+6+8 = 20 marks)

2A. Define ordinary queue? Write a C++ program for inserting an item into, deleting an item from and to display elements from such a queue, along with all necessary conditions using static array.

2B. Give the algorithm for evaluation of Postfix Expression using Stack. Explain the algorithm with an example.

(12+8 = 20 marks)

3A. Implement the functions specified below using singly linked list.

i) LIST search\_insert (LIST , ITEM) that add ITEM to the LIST provided ITEM is not in the LIST.(Insertion can be done at rear end or front end ). Print the appropriate message if the element is present.

ii) Display (LIST) which displays the elements of the LIST in the reverse order.

3B. Assuming the pointer to the first node (NODE first) is global, Implement the following operations on singly linked list:

i) Odd\_count() - Returns the no. of nodes storing odd value in its node.

ii) Reverse() – Reverses the list without creating a new list.

3C. Implement stack operations using doubly linked list.

(6+8+6 = 20 marks)

4A. Define complete binary tree and binary search tree with an example for each.

4B. Give a functions to create BST and display its elements using pre-order traversal.

4C. Write the functions to do following operations on circular doubly linked list with header node assuming a pointer type NODE head as the local variable.

i) Insert\_front → inserts the node at the front end.

ii) Delete\_rear → deletes the node from the rear end.

iii) Insert\_Right → inserts an element to the right of searched node.

(4+6+10 = 20 marks)

- 5A. Write a C++ program to search an element using binary search. Give its time complexity.  
5B. Write algorithm for depth-first-search. Explain with an example.

(10+10 = 20 marks)

- 6A. Sort the following list of numbers using heap sort technique. Show the intermediate steps.  
50, 25, 30, 75, 100, 45, 80

- 6B. Write and explain overflow handling methods in hashing.

(12+8 = 20 marks)

- 7A. Write a program to create a binary tree for a given in-order and post-order traversals.

- 7B. Given two doubly linked lists A and B, representing 2 sets, give the algorithm to create a new doubly linked list C, which is the intersection of A and B.

(12+8 = 20 marks)

- 8A. With example explain the methods used to represent graphs.

- 8B. The Scratchemup parking garage contains a single lane that holds up to 10 cars. Cars arrive at the south end of the garage and leave from the north end. If a customer arrives to pick up a car that is not the northernmost, all cars to the north of his car are moved out, the customer's car is driven out, and the other cars are restored in the same order that they were in originally. Whenever a car leaves, all cars to the south are moved forward so that at all times all the empty spaces are in the south part of the garage

Write a program that reads a group of input lines. Each line contains an a for arrival and d for departure and a license plate number (example: 979WJC). Cars are assumed to arrive and depart in the order specified by the input. The program should print a message each time that a car arrives or departs. When car arrives, the message should specify whether or not there is room in the garage for the car. If there is no room for a car, the car then proceeds to the Knockemdead garage...which is similar to the Scratchemup. There is room for 8 cars at the Knockemdead garage. If both garages are full, cars wait in the street near the Scratchemup garage for a space...and of course they are queued up in the street. The size of the street queue is also 8.

(8+12 = 20 marks)

