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Second Semester MCA Degree Examination, June/July 2014
Data Structures Using C

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions.

- 1 a. Define space complexity and time complexity of a program. Calculate the space needed for one recursive call of the following program:

```
float rsum (float list [ ], int n)
{
    if (n) return rsum (list, n - 1) + list [n - 1];
    return 0;
}
```

(10 Marks)

b. Prove that if $f(n) = a_m n^m + \dots + a_1 n + a_0$, then $f(n) = O(n^m)$. **(05 Marks)**

c. Determine the asymptotic complexity of matrix addition function. **(05 Marks)**
- 2 a. Write a C function to add two polynomials and calculate its asymptotic computing time. **(10 Marks)**
- b. Write a C function to find the transpose of a matrix and determine its time complexity. **(10 Marks)**
- 3 a. Write the prefix and postfix form of the following expressions:
 i) $a * b/c$
 ii) $a * (b + c) / d - g$
 iii) $a/b - c + d * e - a * c$
 iv) $(a + b) * d + e / (f + a * d)$
 v) $a * b - c / d * e + f$. **(10 Marks)**
- b. What is the advantage of using circular queue? Write a program to implement a circular queue. **(10 Marks)**
- 4 a. Implement a stack using linked list. **(10 Marks)**
- b. Explain with an example, the doubly linked circular list and implement the functions for insertion and deletion from such a list. **(10 Marks)**
- 5 a. Define and give examples for the following:
 i) Binary tree; ii) Full binary tree; iii) Complete binary tree. **(06 Marks)**
- b. State and prove any three properties of a binary tree. **(09 Marks)**
- c. Write a C function to implement level order traversal for a binary tree. **(05 Marks)**
- 6 a. Sort the following number using heap sort procedure 21 42 49 52 5 7 81 86. **(10 Marks)**
- b. With respect to binary search tree, explain the following operations with examples:
 i) Three way join; ii) two way join; iii) Split. **(10 Marks)**
- 7 a. Define and give examples for the following:
 i) Leftist tree; ii) Min leftist tree; iii) Weight biased leftist tree. **(12 Marks)**
- b. Define a Fibonacci heap. Explain the steps for deleting an arbitrary node b from the F-heap, with an example. **(08 Marks)**
- 8 a. Write a C function to find an optimal binary search tree. **(10 Marks)**
- b. Explain LR rotation in an AVL tree and write a C function for LR rotation. **(10 Marks)**

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