RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. SECOND SEMESTER EXAMINATION, MAY 2016

FIRST YEAR [BATCH 2015-18]

Date : 28/05/2016 **COMPUTER SCIENCE (General)**

Time : 11 am – 1 pm **Paper :** II Full Marks : 50

[Use a separate Answer Book for each group]

Group – A

Answer <u>any one</u> question from question nos. <u>1 & 2</u> : [1×5]

1. Prove that, the average case time complexity of insertion sort is $O(n^2)$. [n is the size of the input array] 5

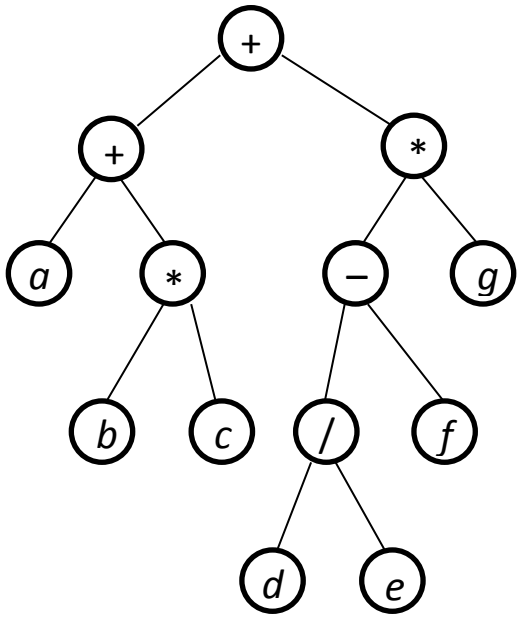
2. Find the generalize formula to find the address of any element in a multi-dimensional array. 5

Answer <u>any two</u> questions from question nos. <u>3 to 6</u> : [2×10]

3. a) Differentiate between recursive algorithm and iterative algorithm citing example of calculation of factorial of an unsigned integer. Write the algorithms also. 1+3+3
   b) Prove that, the address of $a[i_1][i_2]$ in column major order is equal to BASE(a) + SIZE * (i_2*r_1+i_1). [a is the array with r_1 number of rows and r_2 number of columns, BASE(a) is the base address of a, SIZE is the amount of memory needed to store an element of a] 3

4. a) What is the disadvantage of linear queue? How does circular queue overcome it? 1+2
   b) Define Big-Theta (Θ) notation of time complexity. 2
   c) Write an algorithm to insert an element into a sorted doubly linked-list. 5

5. a) Differentiate between full binary tree and complete binary tree with example. 2
   b) If we delete a node from a BST and then insert the node again in that BST, is the resulting BST necessarily the same as before? Justify your answer with example. State what would be the advantages if there were no data types. 2+2
   c) Write down the post-order and in-order traversal of the following tree. 2+2



6. a) What do you mean by ADT? 2
   b) Write an algorithm to merge two sorted array so that the final array is also sorted. 5
   c) Differentiate between different types of space complexity with example. 3

Group – B

Answer any one question from question nos. 7 & 8 : [1×5]

7. What is critical section problem and how to solve it? 5

8. Write a short note on segmentation. 5

Answer any two questions from question nos. 9 to 12 : [2×10]

9. a) Explain PCB. 5
   b) Describe various process states. 5

10. a) Consider the following reference string: 1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6. How many page faults will occur for (i) optimal page replacement (ii) LRU page replacement algorithm using 4 frames. 2+3
    b) Explain sufficient and necessary conditions of deadlock using resource allocation graph. 5

11. a) What is internal fragmentation? Explain the role of virtual memory in operating system. 2+2
    b) Explain Paging scheme. 6

12. a) What is swapping? 2
    b) Discuss starvation and aging. 2+2
    c) Define Compile Time, Load Time and Execution Time. 4

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