RAMAKRISHNA MISSION VIDYAMANDIRA
(Residential Autonomous College under University of Calcutta)

FIRST YEAR
B.A./B.Sc. SECOND SEMESTER (January – June) 2015
Mid-Semester Examination, March 2015

Date : 18/03/2015

Time : 11 am – 1 pm

COMPUTER SCIENCE (Honours)

Paper : II

Full Marks : 50

[Use a separate answer book for each group]
Group – A

(*Answer <u>Question No. 1</u> and <u>any two</u> from the rest*)

1. **Answer <u>any one</u> :** [1×5]
   a) It is required to search an arbitrary array of "n" elements to find the element closer to a given number. Outline an algorithm assuming that the given number is not equal to any of the array elements. [5]
   b) i) Consider the following multidimensional array : $y(3:10, 1:15, 10:20)$. Find the address of y[5, 10, 15] using colour major order. Assume that Base (y) = 400 and y is an integer type array. [3]
   ii) What do you mean by symmetric conditions of a double linked list? [2]

2. Outline an ADT for "List" data structure. In abstract data type how much is specified about implementation? [9+1]

3. a) "There is a simple way to use a circular singly-linked list to to implement both insertion and deletion operations in O(1) time" true or false? Justify. [3]
   b) Outline an algorithm to delete duplicate elements from a double-linked list. [7]

4. a) Outline an algorithm to check whether the following expressing are balanced in terms of parentheses—
   i) $((H) * \{([J+K])\})$
   ii) $((A+B) - \{c+d\}]$

   Show the contents of the stack at each point. [7]
   b) Suppose there are two singly-linked list P & Q in the main memory. And Q is merged with P at a certain point. Outline an idea to find the merging point of those two linked lists.
   [Note point : No algorithm required] [3]

Group – B

Answer <u>any one</u> question :

5. a) Determine the number of correct digits in the number x = 0·4785, where it's relative error $E_r = 0·2 \times 10^{-2}$. [2]
   b) Evaluate the missing terms in the following table : [3]

x	0	1	2	3	4	5
f(x)	0	—	8	15	—	35

6. a) State Lagrange's Interpolation formula. [2]
   b) Prove that the sum of Lagrangian functions or co-efficients is unity. [3]

Answer <u>any two</u> questions :

7. a) Discuss about the different type of errors committed in numerical computation. [3]

 b) If a number be rounded to n correct significant figures and K is the first significant figure in the number then prove that the relative error is less than $\dfrac{1}{K \times 10^{n-1}}$, $(n \neq 1)$. [4]

 c) If $f(x) = 4\cos x - 6x$, find the relative percentage error in f(x) for x = 0, if the error in x = ·005. [3]

8. a) Establish Newton's Forward Interpolation formula and find the error committed in replacing f(x) (original function) by Newton's Forward Formula. [4+3]

 b) Compute f(2), using appropriate interpolation formula from the given table : [3]

x :	0	1	3	4
f(x) :	5	6	50	105

9. a) Evaluate $\int\limits_{0}^{1}(4x - 3x)dx$, taking 10 intervals by Simpson's one-third Rule. Compute also the relative error in your result. [5]

 b) Write down the geometrical interpretation of Trapezoidal Rule. [2]

 c) If h is very small, prove that $\Delta^{n+1}f(x_0) \approx h^{n+1}f^{n+1}(x_0)$. [3]

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