RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. SECOND SEMESTER EXAMINATION, MAY 2017

FIRST YEAR [BATCH 2016-19]

Date : 18/05/2017 **COMPUTER SCIENCE (Honours)**

Time : 11 am – 3 pm **Paper :** II Full Marks : 75

[Use a separate Answer Book for <u>each group</u>]

Group - A

1. Answer **<u>any one</u>** question : [1×5]

   a) Each element of an array a[20][30] requires 4 bytes. Base address is 5000. Determine the location of a[10][15] when the array is stored as row major and column major order. [2·5×2]

   b) What do you mean by ADT? Develop an ADT for stack. [2+3]

Answer <u>any three</u> questions from <u>Question Nos. 2 to 6</u> : [3×10]

2. a) Design an algorithm to implement queue using stack. Also write function to implement appropriate operations.
   b) Compare and contrast between Doubly and Circular linked list. [(3+3)+4]

3. a) Convert the following expression into postfix expression using stack.
   $A\$B*C-D+E/F*(G+H)$.
   b) Explain the following notations : Ω, θ, O. [7+3]

4. a) Explain merge sort algorithm by designing a proper function. Show how the merge sort algorithm will sort the following array in increasing order. 100, 40, 60, 70, 90, 50, 45, 80.
   b) Analyse the time complexity of merge sort algorithm. [(5+3)+2]

5. a) Implement the following function :
      i) Reverse a doubly linked list
      ii) Insert a node after a specified position in a single linked list.
   b) What is the limitation of Binary search? Write a function to perform searching over a set of data with logarithmic time. [(2·5+2·5)+1+4]

6. a) Write an algorithm to evaluate a postfix expression.
   b) Write the algorithm of interpolation search.
   c) What are the best case, average case and worst case time complexity of interpolation search? [4+4+2]

Group - B

Answer <u>any four</u> questions from <u>Question Nos. 7 to 12</u> : [4×10]

7. a) What are the different type of computational errors? Explain with examples.
   b) Determine the number of correct digits in the number x = 1·4785, given it's relative error $E_r = 0 \cdot 2 \times 10^{-2}$.
   c) Prove that $\Delta \log f(x) = \log\left[1 + \frac{\Delta f(x)}{f(x)}\right]$, interval of differencing being h.
   d) Find the missing term in the following table :

x :	16	18	20	22	24	26
f(x) :	39	85	–	151	233	388

[2+3+2+3]

8. a) Evaluate $\int_0^1 e^{-x^2} dx$ by means of Trapezoidal rule with x = 10.

   b) Write down the geometrical interpretation of Newton-Raphson method to find the approximate root of a given equation.

   c) State Lagrange's interpolation formula. [5+3+2]

9. a) Solve the following system of equations by Gauss-Jordan method :
   $x + 2y + z = 8$
   $2x + 3y + 4z = 20$
   $4x + 3y + 2z = 16$

   b) Find a positive root of the equation $xe^x = 1$ lying between (0,1), by bi-section method, correct upto 4 significant figure. [5+5]

10. a) How Euler-Cauchy method differs from Euler's simple method for solving an ordinary initial value differential equation with first order and first degree.

    b) Show that although (2, 3, 2) is a feasible solution to the system of equation
    $x_1 + x_2 + 2x_3 = 9$
    and $3x_1 + 2x_2 + 5x_3 = 22$
    it is not a basic solution, given reason How many basic solutions this system may have?

    c) Solve the following linear programming problem graphically
    Minimize $z = x_1 + x_2$
    Subject to $x_1 + x_2 \geq 2$
    $5x_1 + 9x_2 \leq 45$
    $x_2 \leq 4$ and $x_1 \geq 0,\ x_2 \geq 0$. [3+3+4]

11. a) Use two-phase simplex method to solve the following linear programming problem :
    Maximize $z = 5x_1 - 2x_2 + 3x_3$
    Subject to $2x_1 + 2x_2 - x_3 \geq 2,$
    $3x_1 - 4x_2 \leq 3,$
    $x_2 + 3x_3 \leq 5,$
    $x_1, x_2, x_3 \geq 0$

    b) What do you mean by degenerate basic solution? [8+2]

12. a) Find the dual problem of the following linear programming problem
    Minimize $z = 3x_1 - 2x_2 + 4x_3$
    Subject to $3x_1 + 5x_2 + 4x_3 \geq 7,$
    $6x_1 + x_2 + 3x_3 \geq 4,$
    $7x_1 - 2x_2 - x_3 \leq 10,$
    $x_1 - 2x_2 + 5x_3 \geq 3,$
    $4x_1 + 7x_2 - 2x_3 \geq 2,$
    and $x_1, x_2, x_3 \geq 0$

    b) Find the total cost of the following transportation problem by VAM method. [5+5]

	D_1	D_2	D_3	
O_1	5	2	7	9
O_2	9	15	10	6
O_3	8	18	5	5
	5	5	10	

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