# RAMAKRISHNA MISSION VIDYAMANDIRA

**(Residential Autonomous College affiliated to University of Calcutta)**

**B.A./B.Sc. SECOND SEMESTER EXAMINATION, MAY 2018**

**FIRST YEAR [BATCH 2017-20]**

Date : 19/05/2018 **COMPUTER SCIENCE (Honours)**

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

## [Use a separate Answer Book for each group]

## Group - A [35 marks]

1. Answer **any one** question : [1×5]

   a) Suppose x[m][n] be a two dimensional array having m no. of rows and n no. of columns. Establish an address calculation formulae the location of x[p][q] using column major. [5]

   b) What do you mean by asymptotic notation? Develop an ADT for Doubly Linked List. [2·5+2·5]

Answer **any three** questions from **Question Nos. 2 to 6** : [3×10]

2. a) Implement the enqueue and dequeue functions of priority queue using Singly Linked List. [3+3]
   b) Write down an algorithm to check whether the parenthesis of an arithmetic expression is correct or not. [4]

3. a) Convert the following infix expression into equivalent postfix expression using stack. [3]
   $(A+B)*C-(D-E)/(F+G)$
   b) How a polynomial such as $6x^6+4x^3-2x+10$ can be represented by a linked list. [2]
   c) Write an algorithm to evaluate postfix expression. [5]

4. a) Explain quick sort algorithm by designing a proper function. Show how quick sort algorithm will sort the following array in increasing order. 90, 7, 5, 120, 20, 1, 60, 10, 70, 30. [4+4]
   b) "Quick sort algorithm is not stable but merge sort algorithm is stable" — Justify. [2]

5. a) Implement the following function :
      i) Split a Doubly Linked List from a specified position. [4]
      ii) Write an algorithm to delete all nodes having value greater than 'X' form a given Singly Linked List. [4]
   b) What do you mean by input restricted dequeue and output restricted dequeue. [2]

6. a) Write an algorithm to delete the $n^{th}$ node of a Singly Linked List. The error conditions are to be handled properly. [4]
   b) Compare and contrast between sequential search over binary search in terms of their performance. [2]
   c) Write a function to reverse a Singly Linked List. [4]

## Group - B [40 marks]

Answer **any four** questions from **Question Nos. 7 to 12** : [4×10]

7. a) If $y=4x^5-6x$, find the relative percentage error in y at x = 1, if the error in x = 0·05. [2]
   b) Determine the number of correct digits in the number x, if it's absolute error is given as $E_a=0\cdot53\times10^{-2}$ and x = 0·4575. [1]
   c) Prove that $E\cdot\Delta\equiv\Delta\cdot E$, where E and $\Delta$ carries their as usual meaning. [2]
   d) If a number be rounded to n correct significant figures, then the relative error is less than $\frac{1}{k+10^{n-1}}$, where $n\neq1$ and k is the first significant figure in the number. [5]

8. a) Find $\int_0^{10}\frac{1}{1+x^2}dx$ using Simpson's one third rule. (Here step size is h = 1). [5]

b) Describe the geometrical interpretation of Trapezoidal Rule. [3]

c) State composite Simpson's $\frac{1}{3}$rd rule to evaluate the value of finite integral. [2]

9. a) Using Bi-section method find the root of $3x - \cos x - 1 = 0$. Correct up to five decimal places. [5]

b) Derive the condition for convergency of Newton-Raphson method. [2]

c) Explain procedural difference between Regula-Falsi and Secant method. [3]

10. a) If any system of equations be represented as AX = B, then what will be the conditions for following cases : [2]

i) solution of the system is unique

ii) system has infinite numbers of solution

iii) system has no solution.

b) Using Gauss Jordon method solve the system of equations : [5]

$$x + 2y + z = 8$$
$$2x + 3y + 4z = 20$$
$$4x + 3y + 2z = 16$$

c) Using fourth order Runge-Kutta method, compute y(0·2), given $\frac{dy}{dx} = x^2 + y^2$ with y(0) = 0 and h = 0·1. [3]

11. a) Solve the following Linear programming problem graphically. [3]

Maximize $Z = 2x_1 - x_2$

Subject to $x_1 - x_2 \le 1$

$x_1 \le 3$

and $x_1, x_2 \ge 0$

b) What is basis? Explain with example. [2]

c) Solve the following L.P.P using Simplex method. [5]

Maximize $Z = 30x_1 + 25x_2$

Subject to $x_1 + 2x_2 \le 40$

$3x_1 + 2x_2 \le 60$

and $x_1, x_2 \ge 0$

12. a) For the transportation problem given by the following table, find the solution by the North-West corner and Matrix Minima method. Which method gives the better solution? [5]

| | A | B | C | Supply |
|---|---|---|---|---|
| | 9 | 15 | 12 | 10 |
| | 6 | 8 | 13 | 23 |
| | 9 | 3 | 11 | 27 |
| Demand | 21 | 14 | 25 | |

b) Find the optimal assignments for the assignment problem with the following profit matrix. [5]

| | a | b | c | d | e |
|---|---|---|---|---|---|
| 1 | 32 | 38 | 40 | 28 | 40 |
| 2 | 40 | 24 | 28 | 21 | 36 |
| 3 | 41 | 27 | 33 | 30 | 37 |
| 4 | 22 | 38 | 41 | 36 | 36 |
| 5 | 29 | 33 | 40 | 35 | 39 |

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