RAMAKRISHNA MISSION VIDYAMANDIRA (Residential Autonomous College affiliated to University of Calcutta) FIRST YEAR [BATCH 2018-21] B.A./B.Sc. SECOND SEMESTER (January – June) 2019 Mid-Semester Examination, March 2019

Date : 25/03/2018 Time : 11 am – 1 pm

COMPUTER SCIENCE (Honours)

Paper : II

Full Marks : 50

[5×5]

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

<u>Group – A</u>

(Answer <u>any five</u> questions)

- What is the purpose of the Data Structure? Write a function to merge alternate nodes of two given linked lists to make one list, taking nodes alternatively between the two lists. If either list runs out, all the nodes should be taken from other list. [1.5+3.5]
- 2. What is the function of Stack in data structure? Given an balanced expression that can contain opening and closing parenthesis, check if the expression contains any duplicate parenthesis or not.

For example,

Input: ((X+Y))+Z	Output: Duplicate () found in sub-expression ((X+Y))	
Input: (X+Y)+Z	Output: No Duplicate is found	[1+4]

- 3. What do you mean by Asymptotic notation? Write a function to implement Quick Sort. [2+3]
- 4. a) Convert the AB-C+DEF-+ to its infix expression.
 - b) Implement Queue data structure using two Stacks. [2.5+2.5]
- 5. What is linked list as ADT? Given a singly linked list of integers, determine if the linked list is a palindrome or not.

For example,

Input: $1 > 2 > 3 > 2 > 1 > NULL$	Output: The linked list is a palindrome	
Input: $1 - > 2 - > 3 - > 1 - > $ NULL	Output: The linked list is not a palindrome	[2+3]

- 6. a) Write the advantage of circular queue over non circular queue.
 - b) Given an array containing only 0's, 1's and 2's, sort the array in linear time and using constant space. For example,

Input:
$$\{0,1,2,2,1,0,0,2,0,1,1,0\}$$
, Output: $\{0,0,0,0,0,1,1,1,1,2,2,2\}$ [1+4]

7. Why bubble sort is named as bubble sort? Apply the quick sort algorithm for data set 1,4,7,3,12,9,10,15,29,19 [2+3]

<u>Group – B</u>

(Answer <u>any five</u> questions) [5×5]

- 8. a) Prove that $\Delta u = 3x(x-1)$, when u = x(x-1)(x-2) [2.5]
 - b) What do you mean by Lagrangian functions? Write the main property of those functions. [1.5+1]

- 9. a) Write down the approximate representation of 5/6 correct to 4 significant figures, and then find the relative error of your computation. [1+1.5]
 - b) Compute the missing term in the following table:-

x:	1	2	3	4	5
f(x):	2	4	8	-	32

10.a) Calculate the value of $\int_{0}^{1} \frac{x dx}{1+x}$ correct up to three significant figures taking 4 intervals by Simpson's

one-third rule.

- b) Write down the procedural difference between Regular-Falsi method and Secant method for finding the real root of a given equation.
- 11.a) Write down the geometrical interpretation of Newton-Raphson method.
 - b) Using suitable interpolation formula, find the value of f(0.5) from the following table:-

x:	0.00	0.10	0.20	0.30
f(x):	1.00	1.2214	1.4918	1.8221

- 12. Solve the equation $x^3 9x + 1 = 0$ for the root lying between 2 and 3 correct to 3-significant figures, using method of bisection.
- 13. A businessman has the option of investing his money in two plans. Plan A guarantees that each rupee invested will earn seventy paise a year hence, while plan B guarantees that each rupee invested will earn two rupees two years hence. In plan B, only investments for periods that are multiples of two years are allowed. The problem is how should be invest ten thousand rupees in order to maximize the earnings at the end of three years. Formulate this problem as a linear programming model.
- 14. Old hens can be bought for Rs. 2.00 each but young one costs Rs. 5.00 each. The old hens lay 3 eggs per week and young ones 5 eggs per week, each egg being worth 30 paise. A hen costs Rs. 1.00 per week to feed. If I have only Rs. 80.00 to spend for purchasing the hens, then how many of each kind should I buy to have a maximum profit per week assuming that I can not house more than 20 hens? Formulate this problem as a linear programming model and solve graphically.

_____ X _____

[2]

[2]

[3]

[3]

[2.5]

[5]

[5]

[5]