

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

FIRST YEAR [BATCH 2017-20]

B.A./B.Sc. SECOND SEMESTER (January – June) 2018

Mid-Semester Examination, March 2018

Date : 14/03/2018

Time : 11 am – 1 pm

COMPUTER SCIENCE (Honours)

Paper : II

Full Marks : 50

[Use a separate Answer Book for each group]

Group – A

(Answer any five questions)

[5×5]

1. Write the function to add and multiply two polynomials using singly linked list. [2·5+2·5]
2. How do you perform Queue's enqueue and dequeue operations in constant amount of time using a list. Given a non circular list, show that the list can be used as a stack by writing functions to add and delete elements. [2+3]
3. What do you mean by self referential structure? Write a function to split a circular linked list from a specified position to make it two singly linked lists. [2+3]
4. Write a function to implement following operations : [2·5+2·5]
 - a) Reverse a doubly linked list.
 - b) Merge two sorted singly linked lists.
5. What is stack as ADT? How do you analyze the performance of insertion and deletion operation in circular queue operation? What is asymptotic notation? [2+1+2]
6. Write down the advantages of circular queue? Write the function to implement a priority queue using singly linked list for performing basic operations in such a way so that dequeue operation should be performed in $O(1)$ amount of time. [1+4]
7. Write a function to implement following operations : [2·5+2·5]
 - a) Split a doubly linked list in a given position.
 - b) Count number of nodes in a singly linked list having even value.

Group – B

(Answer any five questions)

[5×5]

8.
 - a) State Lagrange's Interpolation formula. [2]
 - b) Prove that the sum of Lagrangian functions is unity. [3]
9.
 - a) Solve graphically the following L.P.P. [2·5]
Maximize $z = 3x_1 + 2x_2$
Subject to $x_1 - x_2 \leq 1$
 $x_1 + x_2 \geq 3$
 $x_1, x_2 \geq 0$
 - b) Food X contains 5 units of vitamin A and 6 units of vitamin B per gram and costs 20 paise/gm. Food Y contains 8 units of vitamin A and 10 units of vitamin B per gram and costs 30 paise/gm.

The daily requirements of A and B are at least 80 and 100 units respectively. Formulate this as a linear programming problem to minimize the cost. [2·5]

10. a) Prove that $\Delta \log f(x) = \log \left[1 + \frac{\Delta f(x)}{f(x)} \right]$, interval of differencing being h. [2·5]

b) Show that the iterative process, method of bisection converges for finding the real root of an algebraic or transcendental equation. [2·5]

11. Solve the following system of equations by Gauss-Seidel iteration method, correct up to 2-significant figures. [5]

$$2x_1 + x_2 + 5x_3 = 13$$

$$3x_1 + x_2 + x_3 = 7$$

$$x_1 + 4x_2 + x_3 = 9 \cdot 4$$

12. Reduce the following linear programming problem in the standard maximization form : [5]

$$\text{Minimize } z = 3x_1 - 4x_2 + 7x_3$$

$$\text{Subject to } x_1 + x_2 + 7x_3 \leq 50$$

$$5x_1 + 3x_2 = 20$$

$$|3x_2 + 4x_3| \leq 100$$

$$x_1, x_2 \geq 0 \text{ and } x_3 \text{ is unrestricted in sign.}$$

13. a) What do you mean by interpolation and extrapolation? [2]

b) Using suitable interpolation formula, find the value of $f(2 \cdot 5)$ from the following table :

x	:	2	3	4	5
f(x)	:	14·5	16·3	17·5	18·0

[3]

14. a) Write down the geometrical interpretation of Regula-Falsi method. [3]

b) Write down the geometrical interpretation of Trapezoidal rule to evaluate the value of finite integration. [2]

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