

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. SECOND SEMESTER EXAMINATION, MAY 2019

FIRST YEAR [BATCH 2018-21]

COMPUTER SCIENCE (Honours)

Date : 21/05/2019

Time : 11 am – 1 pm

Paper : II [Gr. B]

Full Marks : 40

Answer **any four** questions:

[4×10]

1. a) Determine the number of correct digits in the number $x = 0.37823$, given it's absolute error as 0.6147×10^{-2} . [2.5]
b) If $y = 5\cos x - 4x$, find the relative percentage error in y at $x = 0$, if the error in $x = 0.05$. [2.5]
c) Using suitable interpolation formula, find the value of $f(2.5)$ from the following table: [5]

x	:	0	1	5	7
$f(x)$	:	1	2	146	386

2. a) Evaluate the value of $\int_1^2 \frac{dx}{x}$ using Trapezoidal rule, taking 5 sub-intervals correct up to five decimal places. Also find the absolute and relative error in your result. Given that $\log_e 2 = 0.693147181$. [3+2]
b) Establish the relation between difference operator Δ and $D \left(\equiv \frac{d}{dx} \right)$ of differential calculus. [2.5]
c) Prove that the sum of Lagrangian functions or co-efficients is unity. [2.5]
3. a) Find a real root of the equation $x^3 - 2x - 5 = 0$ by using bi-section method. [5]
b) What is the procedural difference between Gauss-Jacobi and Gauss-Siedel iteration methods? [2.5]
c) What are the conditions for convergency of Newton-Raphson method? [2.5]

4. a) Solve the following system of equations by Gauss-Siedel iteration method, correct up to 2 decimal places. [6]

$$4x_1 + 11x_2 - x_3 = 33$$

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

$$8x_1 - 3x_2 + 2x_3 = 20$$

- b) Use Euler's method with $h = 0.1$ to solve the equation $\frac{dy}{dx} = x^2 + y^2$ with $y(0)=0$ in the range $0 \leq x \leq 0.5$. [4]
5. a) Food X contains 6 units of vitamin A and 7 units of vitamin B per gram and costs 12 paise/gm. Food Y contains 8 units and 12 units of A and B per gram respectively and costs 20 paise/gm. The daily requirements of vitamin A and B are at least 100 units are 120 units respectively. Formulate the above problem as an L.P.P to minimize the cost. [3]
b) Solve the following L.P.P. problem [7]
Maximize $Z = 12x_1 + 3x_2 + x_3$
Subject to $10x_1 + 2x_2 + x_3 \leq 100$
 $7x_1 + 3x_2 + 2x_3 \leq 77$
 $2x_1 + 4x_2 + x_3 \leq 80$
and $x_1, x_2, x_3 \geq 0$

6. a) Find the dual problem of the following linear programming problem [5]

$$\text{Minimize } Z = x_1 + x_2 + x_3$$

$$\text{Subject to } x_1 - 3x_2 + 4x_3 = 5$$

$$x_1 - 2x_2 \leq 3$$

$$2x_2 - x_3 \geq 4$$

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

- b) Solve the minimal assignment problem whose effectiveness matrix is given by [5]

	A	B	C	D
I	2	3	4	5
II	4	5	6	7
III	7	8	9	8
IV	3	5	8	4

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