

SECE) III (R) NUMERICAL TECHNIQUES

Con. 2640-09.

(REVISED COURSE)

VR-3273

(3 Hours)

[Total Marks : 100

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- N.B. : (1) Question No. 1 is compulsory.
 (2) Attempt any four questions out of remaining six questions.
 (3) Make suitable assumptions if required and justify the same.
 (4) Write programs in C/C++.

MASTER

1. (a) Find absolute, relative and percentage error in following numbers. Determine number of significant digits : 5
- (i) $a = 123.41769543$ $\bar{a} = 123.41$
 (ii) $b = 0.0053102500$ $\bar{b} = 0.0051$
 (iii) $c = 450550$ $\bar{c} = 450552.$
- (b) Define the operators Δ , ∇ , δ , μ and E . Prove that - 5
- (i) $2\mu\delta = \Delta + \nabla$ (ii) $E = 1 + \Delta.$
- (c) Using Picard's method solve 5
- $\frac{dy}{dx} = 1 + xy$ such that $y = 0$ when $x = 0.$
- (d) Derive the equation for Regula-falsi method using geometrical interpretation. 5
2. (a) List the bracketing methods and open methods and find the real root of the equation $x \sin x + \cos x = 0$ using Newton-Raphson method correct to three decimal places. 10
- (b) Solve the following equations by Gauss-Seidel method. 10
- $27x + 6y - z = 85, 6x + 15y + 2z = 72, x + y + 54z = 110.$
3. (a) From the following table find the number of students who obtained marks less than 45. 10

Marks	30-40	40-50	50-60	60-70
No. of students	31	42	51	35

- (b) Using Newton's divided difference formula, find the value of $f(9)$ from the following table. 10

x	5	7	11	13	17
f(x)	150	392	1452	2366	5202

4. (a) Write a program for Lagrange's interpolation method and using this formula, find the value of y when $x = 10$ from the following table. 10

x	5	6	9	11
y	12	13	14	16

- (b) The result of measurement of electric resistance R of a copper bar at various temperatures $t^\circ\text{C}$ are listed below : 10

t	19	25	30	36	40	45	50
R	76	77	79	80	82	83	85

Find a relation $R = a + bt$

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5. (a) The velocity of the train which starts from rest is given by the following table, the time being reckoned in minutes from the start and speed in km/hour. 10

Time	3	6	9	12	15	18
Velocity	22	29	31	20	4	0

Estimate approximately the distance covered in 18 minutes by Simpson's 3/8th rule.

- (b) Solve $\frac{dy}{dx} = x + y^2$ with $x_0 = 0, y_0 = 1$ by Euler's modified formula find the value of y when $x = 0.5$ taking $h = 0.25$. 10
6. (a) Solve $\frac{dy}{dx} = x + y$ with initial conditions $y(1) = 2$ and find y at $x = 1.2, x = 1.4$ by Runge-Kutta Method of Fourth Order taking $h = 0.2$. 10
- (b) Write a algorithm and c/c++ program for Gauss Elimination method and also solve the following set of equations using Gauss Elimination method. 10
- $2x + y + z = 10, \quad 3x + 2y + 3z = 18, \quad x + 4y + 9z = 16.$
7. (a) Explain the propagation of errors. 5
- (b) Derive Newton Cotes integration formula and also write a program Simpson's 1/3rd rule. 10
- (c) Write a short note on Golden section search. 5

Mark	30-40	40-50	50-60	60-70	70-80
No. of students	21	25	22	28	24

x	2	3	4	5	6
f(x)	150	362	1424	3384	502

x	0	1	2	3
y	18	14	18	14

I	10	25	50	75	100
R	15	77	79	80	82