

This question paper contains 4 printed pages]

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S. No. of Question Paper : 1090

Unique Paper Code : 251401

E

Name of the Paper : Numerical Technique (ELHT 401)

Name of the Course : B.Sc. (H) Electronics

Semester : IV

Duration : 3 Hours

Maximum Marks : 75

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt five questions in all, including Q. No. 1 which is compulsory

(In Q. No. 1 attempt any five parts only).

Use of scientific calculator is allowed.

1. (a) The value of π is 3.1415926. Find the absolute and relative error :
- (i) π is rounded to 4 decimal digits
- (ii) π is truncated to 4 decimal digits.
- (b) For the tabulated data, construct divided difference table :

x	$F(x)$
-1	3
0	-6
3	39
6	822
7	1611

P.T.O.

- (c) What is least square fit ? Use it to find coefficients in linear regression.
- (d) What is the error formula for order of the error in the Runge-Kutta IV order method for solution of first order differential equation ?
- (e) If $a = 0.5555E1$, $b = 0.4545E1$, $c = 0.4535E1$, find $(a * b) - c$ using 4 digit mantissa in computer arithmetic. 5×3=15

2. (a) Find the root of the equation :

$$F(x) = x^3 + 2x - 2 = 0$$

using false position method upto three significant digits. 7

- (b) Explain Newton-Raphson method to solve algebraic and transcendental equation. 8
3. (a) Derive the formula for Lagrange's interpolation formula for non-uniform intervals. 8
- (b) Using Newton's forward interpolation formula find the cubic polynomial which takes the following values : 7

X	Y
0	1
1	2
2	1
3	10

Hence evaluate $Y(1.5)$.

4. (a) Derive Simpson's 1/3 rule and estimate the error involved in it. 7

- (b) A rocket is launched vertically upward from the ground. Its acceleration is registered during the first 80 seconds and is given in the table below : 8

t (s)	a (m/s ²)
0	30.00
10	31.63
20	33.44
30	35.47
40	37.75
50	40.33
60	43.29
70	46.69
80	50.67

Find the velocity of the rocket at $t = 80$ seconds.

5. (a) Derive the Heun's method for the solution of first order differential equation graphically. 7
- (b) Find the solution in the interval (0, 0.5) of the following differential equation using Euler's Cauchy Method $dy/dx = x + y$. Given $h = 0.25$ and $y = 0$ at $x = 0$. 8
6. (a) Using the Dolittle LU decomposition method determine the unknowns x_1, x_2 and x_3 from the following equations : 7

$$x_1 + 5x_2 + x_3 = 14$$

$$2x_1 + x_2 + 3x_3 = 13$$

$$3x_1 + x_2 + 4x_3 = 17$$

(b) Solve using Gauss Elimination method the following set of equations : 8

$$13x_1 + 5x_2 - 3x_3 + x_4 = 18$$

$$2x_1 + 12x_2 + x_3 - 4x_4 = 13$$

$$3x_1 - 4x_2 + 10x_3 - x_4 = 29$$

$$2x_1 + x_2 - 3x_3 + 9x_4 = 31.$$

7. (a) Fit a curve of the type ae^{-bx} for the given data : 7

x	y
0.5	1.7
0.75	1.0
1.0	0.68
1.25	0.42
1.5	0.26

(b) Compute $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ for $x = 1$ and $x = 6$: 8

x	y
1	1
2	8
3	27
4	64
5	125
6	216