

B.Sc. Semester-VI Examination, 2022-23**ELECTRONICS [Honours]****Course ID : 61716 Course Code : SH/ELC/603/DSE-3(T)****Course Title : Numerical Techniques**

Time : 1 Hour 15 Minutes

Full Marks : 25

*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.*

1. Answer any **three** of the following: $1 \times 3 = 3$
- An approximate value of e is 2.7195518 and its true value is given by 2.71821828. Find relative error.
 - Round-off the following numbers to four decimal places: 3.3465827, 5.375829, 54.2549757 and 0.00457328.
 - When Newton's backward interpolation formula is used?
 - In Numerical integration, what should be the number of intervals to apply Simpson's one-third rule and Simpson's three-eighth rule?

[Turn over]

- How many significant figures are there in π ?
- Round-off the number 0.987250 correct to four significant figures and find the percentage error.

2. Answer any **three** of the following: $2 \times 3 = 6$
- Prove that $E = 1 + \Delta$ where Δ is forward difference operator and E is shift operator.
 - Prove that $\Delta^3 y_0 = y_3 - 3y_2 + 3y_1 - y_0$.
 - Compare Gauss-Siedel and Gauss elimination method.
 - Construct the forward difference table from the following tabulated function:

x	0	1	2	3	4	5
$f(x)$	12	15	20	27	39	52

- What are eigenvalue and eigenvector of a square matrix?
 - Round off the numbers 865250 and 27.46235 to four significant figures and compute absolute, relative and percentage error in each case.
3. Answer any **two** of the following: $5 \times 2 = 10$
- Find a root of the equation $x^3 - 4x - 9 = 0$ using Bisection method correct to three decimal places.

b) Solve the following equations by Gauss elimination method:

$$2x + y + z = 10, 3x + 2y + 3z = 18, x + 4y + 9z = 16.$$

c) Prove that

i) $\nabla = 1 - E^{-1}$ and

ii) $\Delta = E\nabla = \nabla E = \delta E^{\frac{1}{2}}$,

where the symbols have their usual meanings.

$$2\frac{1}{2} + 2\frac{1}{2} = 5$$

d) Find the polynomial for the following data by Newton's backward difference formula:

x	0	1	2	3
$f(x)$	-3	2	9	18

4. Answer any **one** of the following: $6 \times 1 = 6$

a) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using (i) Trapezoidal rule and (ii) Simpson's 3/8th rule and then compare the results with its actual value. $3+3=6$

b) Given $\frac{dy}{dx} = \frac{y-x}{y+x}$ with initial condition $y = 1$ at $x = 0$. Find y for $x = 0.1$ by Euler's method.

c) Solve the following system of equations by Gauss-Seidal method:

$$20x + y - 2z = 17, 3x + 20y - z = -18, 2x - 3y + 20z = 25.$$
