

Exam		Regular Back	
Level	BE	Full Marks	80
Programme	All (Except B.Arch.)	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Numerical Methods

Candidates are required to give their answers in their own words as far as practicable.

Attempt any Five questions. Question No. 6 is compulsory.

The figures in the margin indicate Full Marks.

Assume suitable data if necessary.

1. a) Find the point with accuracy 0.001, where the line $y = x - 3$ and $y = \ln x$ is intersecting, using bisection method. [8]

- b) Calculate the root of non-linear equation $f(x) = \sin x - 2x + 1$ using secant method. The absolute error of functional value at our calculated root should be less than 10^{-5} . [8]

2. a) Find the missing values of collected water level using Lagrange's interpolation. [8]

Time duration of rainfall (t) min	1	3	6.5	10
Collected Water level (h) mm	23	61	?	203

- b) Use the suitable method and determine the exponential fit of $y = Ce^{Ax}$ for the following data: [8]

X	0	1	2	3	4
Y	1.5	2.3	3.5	5.0	7.5

3. a) Evaluate the integral $I = \int_0^{1.5} \sin x dx$, compare the absolute error in both conditions for Simpson 1/3 rule and Simpson's 3/8 rule. [8]

- b) Use Romberg Integration find the integral of $e^x \sin x$ between the limits -1 and 1. [8]

4. a) Find the inverse of the matrix $A = \begin{bmatrix} 2 & -2 & 4 \\ 2 & 3 & 2 \\ -1 & 1 & 1 \end{bmatrix}$ using Gauss-Jordan method. [8]

- b) Solve the following by Gauss Elimination method with complete pivoting. [8]

$$\begin{aligned} 2x + 3y + 2z &= 2 \\ 10x + 3y + 4z &= 16 \\ 3x + 6y + z &= 6 \end{aligned}$$

5. a) Solve the following differential equation within $0 \leq x \leq 1.0$ using RK 4th order method. [8]

$$\frac{d^2 y}{dx^2} + \frac{dy}{dx} - 4y = 3x, \text{ with } y(0) = 0 \text{ and } y'(0) = 1. \text{ (take } h = 0.5)$$

- b) Consider a sheet metal of size 30cm by 30cm. The two adjacent sides are maintained at temperature of 50°C and other two sides are held at 500°C. Calculate the steady state temperature at interior points assuming a grid size of 10cm by 10cm. [8]

6. Write algorithm flow chart and program code of any high level language to solve polynomial of n^{th} degree using Harner's rule. Your program should read the coefficients of polynomial and display all roots of that polynomial correct up to five decimal places. [5+5+6]