

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 root of the equation  $e^x - 3x = 0$  correct upto three decimal places using bisection method. [8]

- b) Find the reciprocal of 3 using Newton Raphson method. [8]

2. a) Apply Newton's forward difference formula to find y(3.5) from the following data. [8]

x	1	2	3	4	5	6	7	8
y	1	8	27	64	125	216	343	512

- b) Obtain a relation of the form  $y = ae^{bx}$  for the following data by the method of least squares. [8]

x:	0.0	0.5	1.0	1.5	2.0	2.5
y:	0.10	0.45	2.15	9.15	40.35	180.75

3. a) Use Romberg integration method to evaluate the integral  $\int_1^2 \frac{dx}{x}$  correct upto 3 decimal places taking the initial sub interval size as  $h = (b - a)/2$ . [10]

- b) The velocity V of a particle at a distance S from a point on its path is given in the table below: [6]

S (ft)	0	10	20	30	40	50	60
V (ft/sec)	47	58	64	65	61	52	38

Estimate the time taken to travel a distance of 60ft by using Simpson's 1/3 rule.  
Compare the result with Simpson's 3/8 rule.

4. a) Find the largest eigen value correct to three significant digits and corresponding eigen vector of the following matrix using power method. [8]

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & 4 \\ 3 & 4 & 5 \end{bmatrix}$$

- b) Use Gauss Jordan method to find the inverse of the following matrix. [8]

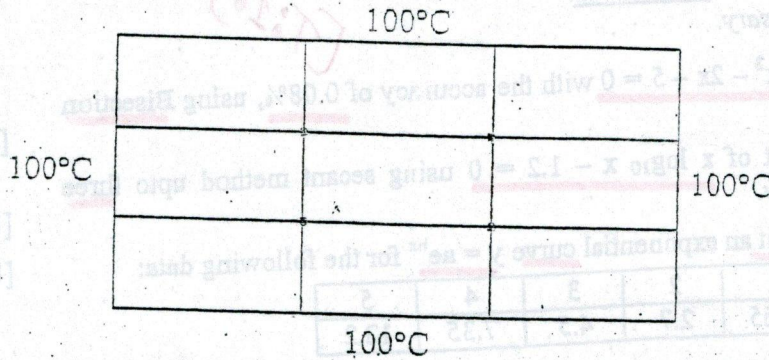
$$A = \begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$$



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5. a) Solve  $y' = xy + y^2$ ,  $y(0) = 1$  for  $y(0.1)$  and  $y(0.2)$  using Runge-Kutta method of fourth order. [8]

b) Consider a metal plate of size  $30\text{cm} \times 30\text{cm}$ , the boundaries of which are held at  $100^\circ\text{C}$ . Calculate the temperature at interior points of the plate. Assume the grid size of  $10\text{cm} \times 10\text{cm}$ . [8]



Write algorithm, flowchart and program code in any one of the high level languages (FORTRAN or C) to fit the parabola  $y = a + bx + cx^2$  where  $a$ ,  $b$  and  $c$  are constants. Hence find the value of  $y$  when  $x$  is a user defined value. [16]

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