24 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2068 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, B.Agri.	Pass Marks	32
Year / Part	II / II	Time	3 hrs.

Subject: - Numerical Methods

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Find a real root of $x^5 - 3x^3 - 1 = 0$ correct up to four decimal places using the Secant Method. [8]
2. Write a Pseudo-code to find a real root of a non- linear equation using Bisection Method. [4]
3. Obtain the iteration formula of Secant method and explain its working procedure in finding a root of a non linear equation. [4]

OR

Explain the working principle of the bisection method to find a real root of a non-linear equation.

4. Solve the following set of linear equations using a suitable iterative method. [8]

$$2x + y + z - 2w = -10$$
$$4x + 2z + w = 8$$
$$3x + 2y + 2z = 7$$
$$x + 3y + 2z - w = -5$$

5. Find the largest eigen value and corresponding eigen vector of the following matrix, using power method [8]

$$\begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$$

6. Find the values of y at x = 1.6 and x = 4.8 from the following points using Newton's interpolation technique. [8]

x	1	2	3	4	5
y	4	7.5	4	8.5	9.6

7. Find a curve of the form $y = ab^x$ that fits the following set of observations using least square method. [8]

x	1	2	3	4	5
y	1.2	2.5	6.25	15.75	28.65

8. The following table gives the angle in radians (θ) through which a rotating rod has turned for various values of time in seconds (t). Find the angular velocity and angular acceleration at t = 0.2. [4]

t	0	0.2	0.4	0.6	0.8
θ	0	0.122	0.493	0.123	2.022

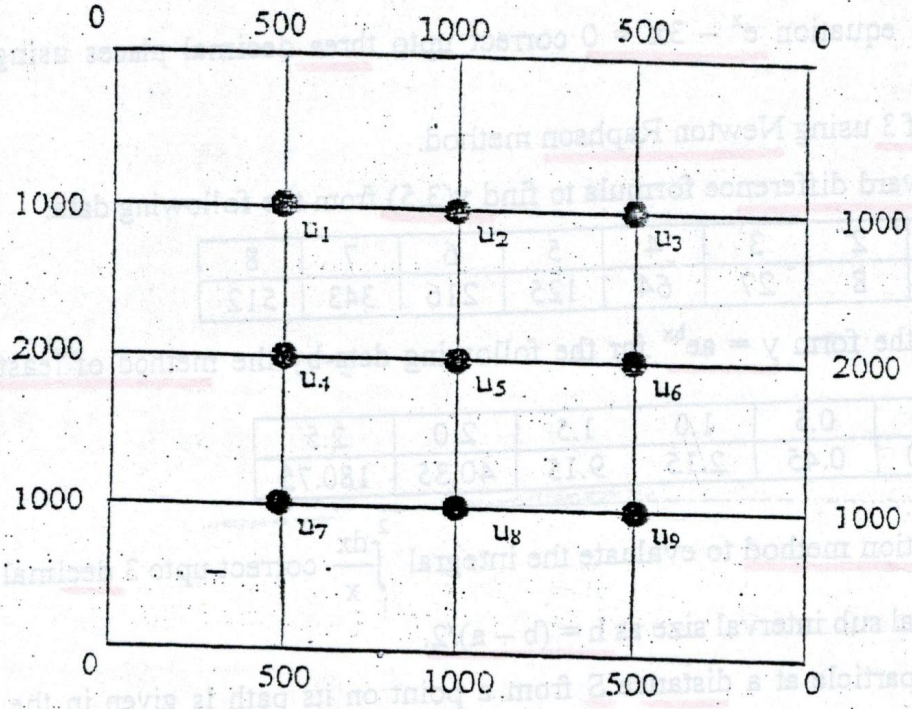
2068 Bhadra

9. Use Romberg's method to compute $\int_1^2 \frac{2}{1+x^2}dx$. [6]

10. Using the Runge-Kutta method of second order, obtain a solution of the equation $y' = xy + y^2$, with the initial condition $y(0) = 1$ for the range $0 \le x \le 0.6$, with increments of 0.2. [6]

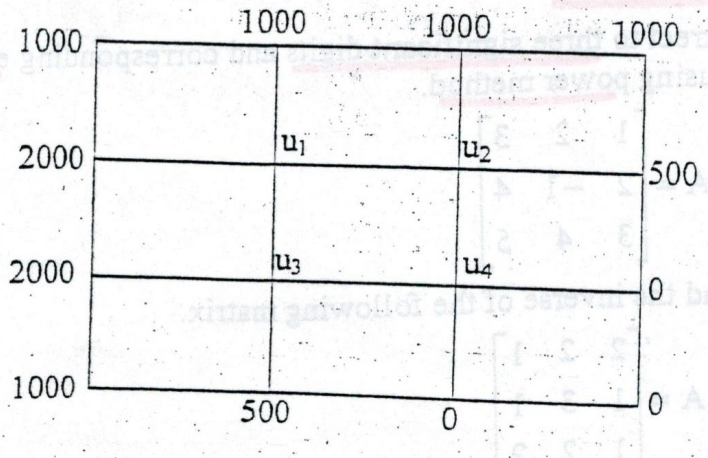
11. Solve the following boundary value problem using the finite difference method, by dividing the interval into four sub-intervals. $\frac{d^2y}{dx^2} = x + y, y(0) = y(1) = 0$. [6]

12. Solve the elliptic equation $u_{xx} + u_{yy} = 0$ for the following square mesh with the boundary values as shown. [10]



OR

Given the values of u(x, y) on the boundary of the square as shown in the figure below, evaluate the function u(x, y) satisfying the Laplace $\nabla^2 u = 0$ at the pivotal points, using standard five point formula iterative method.



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