

# Pre-University Examination Questions

## paper collection



Provided By:

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## Numerical Method

NEC(Safal Poudel)

LEC(samir KC)

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*Pokhara University*  
*Everest Engineering College*  
**Final Internal Assessment**  
**Spring - 2025**

**Level:** Bachelor

**F.M.** 100

**Program:** BE CMP(4<sup>th</sup> Semester)

**P.M.** 45

**Faculty:** Science & Technology

**Time:** 3hrs

**Section:** A/B

**Subject:** Numerical Methods

*Attempt all the questions.*

1. a) Find out at least one real root of  $x^3 + x^2 - x - 1 = 0$  using Secant method to three decimal places. 7

- b) Find out all real roots of the equation  $x \log_{10}x = 1.2$  using Newton Raphson method or fixed point iteration. 3

2. a) The following set of data represent the position of a car in a road at specified time, Calculate the position of the car at  $T = 1.75$  hours. (You can use any method) 7

	$x_0$	$x_1$	$x_2$	$x_3$	$x_4$
Time(hr)	0	0.5	1.0	1.5	2.0
Position(km)	0	0.25	1.0	2.25	4.0

OR

Find the missing value from the following table.

x	1	2	?	2.5	3.5
y	0.125	0.5275	0.7520	1.125	2.125

- b) For the following set of data, fit a curve  $y = ae^{bx}$  using least square method. 8

$x_i$	0.5	1.5	4.5	7.5
$f(x_i)$	2.5	3.5	6.5	9.5

y

3. a) Integrate the given integral

$$\int_1^3 \cos x dx$$

7

Using trapezoidal, simpson's  $\frac{1}{3}$  and  $\frac{3}{8}$  rule.

- b) Using two- and three-point Gauss Legendre formula. Evaluate

$$\int_{0.5}^{1.5} e^{x^2} dx$$

2

4. a) Solve the following system of linear equation using Gauss Jordan Elimination or Cholesky Method.

$$2w + x + 3y - z = 9$$

$$-3w + x - 2y + z = -4$$

$$w + 2x - y + 2z = 5$$

$$3w - x - y + 2z = 1$$

- b) Find the largest Eigen-value and the corresponding Eigen-vector of the following square matrix using power method.

$$\begin{bmatrix} 3 & 1 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 5 \end{bmatrix}$$

6

5. a) Find the value of y at x = 2.0 for the following initial value problem by using Euler method.  $y' = x + y^2$ ;  $y(1) = -0.8$ , step size h = 0.5.

- b) Solve  $\frac{d^2 y}{dx^2} + \frac{2dy}{dx} + 6y = x$ , with  $y(0) = 0$ ,  $y'(0) = 1$  for  $y(0.2)$  taking h = 0.2 by RK4 method.

4

7

6. a) Solve the Poisson equation  $\nabla^2 f = 2x^2 + y$ , over the square domain  $1 \leq x \leq 4$ ,  $1 \leq y \leq 4$ , with  $f=0$  on the boundary.

3

- b) A steel plate is of size 15 cm  $\times$  15 cm. If two of the sides are held at 100 °C and other two sides are held at 0 °C, what is the steady state temperature at interior points assuming a grid size of 5 cm  $\times$  5 cm?

7

7. Write short notes on (Any Two)

2x5

- a) Errors in numerical computing  
b) Cubic spline interpolation  
c) Solution of differential equation

Final Internal Exam

Level: Bachelor

Programme: BE Computer/Electrical 4<sup>th</sup> sem

Course: Numerical Methods

Year: 2025

Full Marks: 100

Time: 3 hr

Attempt all questions.

Q>1(a) Find the root of the equation  $4e^{-x}\sin x - 1 = 0$  using secant method given that the root lies between 0 and 0.5 correct to three decimal place. (8)

Q>1(b) Find the square root of 18 using NR method correct to 3 decimal place. (7)

Q>2(a) Find the root of the equation  $x^3 + x^2 - 1 = 0$  correct to 6 decimal place using fixed point iteration method. (8)

Q>2(b) A third degree polynomial passes through (0.1), (1,-1), (2,-1) and (3,2). Find its value at  $x = 4$  using forward difference interpolation. (7)

Q>3(a) Find the distance moved by a particle and its acceleration at the end of 4 seconds if the time versus velocity data is as follows: (8)

Time(t)	0	1	3	4
Velocity (v)	21	15	12	10

Q>3(b) Fit the exponential curve  $y = ae^{bx}$  to the following data (7)

x	2	4	6	8	10
y	25	38	56	81	104

Q>4(a) Using Gaussian 2 point and 3 point quadrature formula, evaluate  $\int (\tan^{-1} x/x) dx$  with lower limit 0 and upper limit 1. (8)

Q>4(b) Solve the following set of equation using LU factorization method (7)

$$x+2y+3z=5$$

$$2x+8y+22z=6$$

$$3x+22y+82z=-10$$

Q>5(a) Find the largest eigen value and corresponding eigen vector using power method (8)

$$A = \begin{pmatrix} 15 & -4 & -3 \\ -10 & 12 & -6 \\ -20 & 4 & -2 \end{pmatrix}$$

Q>5(b) Solve the first order IVP by RK-1:  $y' = x+y$ ,  $y(0)=0$  at  $x=1$  taking  $h=0.2$ . (7)

Q>6(a) Solve the following boundary value problem by shooting method  $y'' = 6x+4$ ,  $y(0)=2$ ,  $y(1)=5$  by applying RK-2 method. (8)

Q>6(b) Solve the equation  $\nabla^2 u = -8xy$ ,  $0 < x < 1$ ,  $0 < y < 1$  with  $h=1/3$ ,  $u(0,y)=u(x,0)=0$  &  $u(1,y)=u(x,1)=100$  (7)

Q>7 Write short notes on: (any two)

- (i) Gauss Jacobi method
- (ii) Errors in Numerical Methods
- (iii) Interpolation

0.2083

(5\*2=10)

0.213

0.6678

0.7887

0.1122 | 0.7258

**GANDAKI COLLEGE OF ENGINEERING AND SCIENCE**  
 Semester: Spring

Level: Bachelor

Programme: BE CE & SE IV

Course: Numerical Methods

Year : 2025

Full Marks: 100

Pass Marks: 45

Time : 3hrs.

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

*Attempt all the questions.*

1. a) What are the different types of errors ? Solve the following equation  $f(x) = xe^x - \cos x$  by Newton Raphson Method upto 4 decimal places. (2+6)
- b) Using secant method, find a positive real roots of the equation  $x^3 - 2x + 1 = 0$ , correct to 4 decimal places. 7
2. a) From the given data find the lagrange polynomial and evaluate  $f(2.5)$ . 8

x	1	2	4	5	7
F(x)	1	1.414	1.732	2.00	2.6

OR

Explain difference between interpolation and extrapolation ? Find the value of  $y(1.5)$  using cubic interpolation.

x	1	2	3	4
y	1	2	5	11

7

- b) Use the suitable method to fit a curve  $y = ae^{bx}$  for the following data.

x	-2	-1	0	1	2	3	4
y	38	6	0	-5	-1	130	300

3. a) Compute the following using Simpson's 1/3 rule for  $n= 8$  with an accuracy to five digit. 8

$$\int_{1}^{5} e^{-x^2} dx$$

OR

1

Use Romberg integration to evaluate the following.

$$\int_{\frac{1}{2}}^{\frac{5}{2}} \log x \, dx$$

7

- b) Evaluate the following using Gaussian three point Integration formula:

$$\int_{\frac{1}{2}}^{\frac{1}{4}} (x^4 + 1) \, dx$$

4. a) Solve the following system of Linear equations using partial pivoting method.

$$x + y + z = 4, \quad x + 4y + 3z = 8, \quad x + 6y + 2z = 6$$

8

- b) Solve the following system of equations using Gauss Seidel method.

$$3x + 2y + z = 10, \quad 2x + 3y + 2z = 14, \quad x + 2y + 3z = 14$$

7

5. a) From the following differential equation estimate the value of  $y(1)$  using RK 4<sup>th</sup> order.

8

$$\frac{dy}{dx} + 2x^2y = 4 \text{ with } y(0) = 1 \text{ take } h=0.5$$

- b) Find the dominant eigen value and corresponding eigen vectors of the matrix below using Power method.  $\begin{pmatrix} 1 & 2 & 0 \\ 2 & 1 & 0 \\ 0 & 0 & -1 \end{pmatrix}$ .

7

6. a) Solve the Poisson equation  $\nabla^2 f = -10(x^2 + y^2 + 10)$  over the square with  $0 \leq x \leq 3; 0 \leq y \leq 3$  and  $f = 0$  on boundary. Use  $h = 1$ .

8

- b) Solve the following differential equation for  $y(0.4)$  using Heun's method.

7

$$\frac{d^2y}{dx^2} + 2\frac{dy}{dx} - 3y = 6x; \text{ with } y(0) = 0 \text{ and } y'(0) = 1 \text{ (take } h=0.2).$$

7. Write short notes on: (Any two)

5\*2

- a) Shooting Method  
b) Algorithm for Matrix factorization method  
c) Schmidt method for Heat equation.

**Term Test II**

Date:	2082/04/05	Full Marks	70
Level	BE	Time	
Programme	BCE		

**Subject: - Numerical Methods**

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt 70 Marks questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. a) Derive the iterative formula for NR method. Use the Newton-Raphson method to find a root of the equation  $x\sin(x) + \cos(x)$  near  $x_0=\pi$ . Perform four iterations. [2+5]
- b) Differentiate between false position method and bisection method. Find a real root of the equation  $x^3-4x-9=0$  using the Bisection method, correct to three decimal places. [8]

2. a) The function  $f(x)$  is known only at the following unequal intervals:

x	5	7	11	13	17
$f(x)$	12	16	28	36	60

Use Newton's Divided Difference Interpolation Formula to compute  $f(9)$ .

- b) The following data relates temperature  $x$  and the resistance  $R$  of a thermistor.

x( $^{\circ}$ C)	0	10	20	30	40
$R(\Omega)$	100	80	65	50	40

Fit a linear regression model of the form:  $\log_{10}R=a+bx$  using least square method. Find the estimated resistance at  $25^{\circ}$ C. [8]

3. a) Use Romberg integration to estimate  $\int_0^1 \frac{1}{1+x^2} dx$  to a tolerance of  $10^{-4}$ . Compare the estimated solution with the true solution. [7]
- b) What are the needs of using numerical differentiation? A car's distance (in meters) after every 2 seconds is recorded:

Time(s)	0	2	4	6
Distance(m)	0	4	16	36

Find the speed and acceleration of the car at 4 seconds using central difference formula. [8]

4. a) What are limitations of Naïve Gauss elimination method? Use partial pivoting method to solve the following simultaneous algebraic equations. [7]

$$x+2y+z=9$$

$$2x+3y+3z=21$$

$$3x+y+2z=17$$

- b) Solve the system of equations using Jauiss-jacobi method and Gauss-Seidel method (up to four iterations) with the same initial guess and comments on speed of convergence. [8]

$$10x+y+z=6$$

$$x+10y+z=6$$

$$x+y+10z=6$$

5. a) Solve the same equation  $\frac{dy}{dx} = x + y; y(0) = 1$  using the **Improved Euler method** with step size  $h=0.2$ , find  $y(0.4)$ . [7]

b) Use the **Runge-Kutta 4th order method** to solve:  $\frac{dy}{dx} = x^2 + y; y(0) = 1$   
Find  $y(0.2)$  using step size  $h=0.1$ . [8]

6. a) Consider the one-dimensional heat equation  $u_t = u_{xx}$   
Solve this equation for a rod of length 1, subject to the conditions: Boundary conditions:

$u(0, t) = 0, u(1, t) = 0$  and Initial condition:  $u(x, 0) = 100\sin(\pi x)$  [7]

b) A square plate of size 1m x 1m is governed by the Laplace equation,  $u_{xx} + u_{yy} = 0$ , representing its steady-state temperature distribution. The boundary conditions are as follows: **Top Edge**:  $u(x, 1) = 100^\circ\text{C}$ , **Left Edge**:  $u(0, y) = 0^\circ\text{C}$ , **Bottom Edge**:  $u(x, 0) = 0^\circ\text{C}$ , **Right Edge**:  $u(1, y) = 0^\circ\text{C}$ . Use a square mesh with step size  $h = \Delta x = \Delta y = 1/3$  [8]

7. Write short notes on: (*any two*) [5\*2=10]

- a) Algorithm of secant method
- b) Shooting method
- c) Lagrange Interpolation

**Madan Bhandari College of Engineering**

**Internal Assessment-2082**

**Level: Bachelor  
Programme: BE**

**Course: Numerical Methods  
Time: 3 hours**

**Full Mark: 100  
Pass Mark: 45**

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

1. a) Find the root of the equation  $f(x) = x^2 - 4x - 10$  correct to three decimal places by using False Position method. 7
- b) Estimate the root of the equation  $f(x) = xe^x - \cos x$  using Newton Raphson method correct to three decimal places. 8
2. a) From the data given below, find the number of students whose weight is between 60 and 70. 7

Weight in lbs	0-40	40-60	60-80	80-100	100-120
No. of students	250	120	100	70	50

- b) Using the method of least square, fit the curves  $ax^2 + \frac{b}{x}$  to the following data 8

x	1	2	3	4
y	-1.52	0.96	8.88	7.66

OR

If P is pull required to lift a load W by means of a pulley, find the laws of form  $P=mW+C$ , (Where m and c are constants) using least square method for the following data:

P	12	15	21	25
W	50	70	100	120

3. a) Evaluate  $\int_1^{5.1} \frac{1}{x} dx$  using Gaussian Integration formula for n=3 and compare the value with the exact solution. 7
- b) Using the Romberg integration find the solution correct up to three decimal places. 8

$$I = \int_0^1 \frac{1}{1+x^2} dx$$

4. a) Solve the following system of equations using Gauss Jacobi's method. 7  
 $3x+2y+z=10, 2x+3y+2z=14, x+2y+3z=14$

- b) Solve the following system of linear equations using partial pivoting method. 8

$$x+y+z=4; x+4y+3z=8; x+6y+2z=6$$

5. a) Find the largest eigen value and the corresponding eigen vector of the matrix 7

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

using power method.

- b) Using the R-K 1<sup>st</sup> order method, find an approximate value of y corresponding to x=1, given that  $\frac{dy}{dx} = \frac{y-x}{y+x}$  and y=1, when x=0 and h=0.02 8

6. a) Torsion on a square bar of size 15cm\*15cm. If two of the sides are held at 100°C and the other two sides are held at 0°C. Calculate the steady state temperature at interior points. Assume a grid size of 5cm\*5cm. 7

- b) Solve the poisson equation  $\nabla^2 f = 2x^2 + y$ , over the square domain  $1 \leq x \leq 4, 1 \leq y \leq 4$  with f=0 on the boundary. Take step size in x and y, h=k=1 8

7. Write short notes on: (Any two) 10
  - a) Error in Numerical method.
  - b) Ill conditioned and well-conditioned systems
  - c) Cubic spline.

**\*\*\*Best of Luck\*\*\***

# Universal Engineering & Science College

Affiliated to Pokhara University

Chakupat, Lalitpur

Level: Bachelor

Semester: 4<sup>th</sup>

Year : 2025

Programme : BE Computer

Time : 3 hours

Full Marks: 100

Subject: Numerical Methods

Pass Marks: 45

## Pre-Board Examination-2082 (Spring 2025)

Candidates are required to give their answer in their own words as far as possible. The figure in the margin indicate full marks

**Attempt all the questions:**

- a) Write algorithm for bisection method and solve  $e^{-x} - x$  correct upto 3 decimal place. [8]
- b) Derive Newton's Raphson method formula for solving non-linear equations and use this method to solve  $x^3 - 4x - 9 = 0$  up to four decimal places. [7]

OR

Solve above question by secant method correct upto four decimal places.

- a. Given the following data points, estimate  $f(0.45)$  using suitable backward interpolation: [8]

X	0.1	0.2	0.3	0.4	0.5
y	2.68	3.04	3.38	3.69	3.97

- b. Find  $f(1.6)$  using cubic spline method. [7]

X	1	2	3	4
Y	1	1.414	1.732	2

- a. Evaluate  $\int_{0.2}^{1.5} e^{-x^2} dx$  by Romberg method correct up-to 3 decimal place taking  $n=2,4,8$ . [8]

- b. Compute  $\int_1^3 \sin x dx$  using Simpson's 1/3 and 3/8 rule taking suitable sub interval. [7]

- a. Solve the following system of linear equations using the Gauss-Seidel method. [7]

$$5x + y - z = 10$$

$$2x + 8y + z = 11$$

$$-x + y + 4z = 3$$

b. Solve the following system of linear equations using gauss elimination method:

[8]

$$x+2y+z=9, 2x-y+z=3, 3x+2y+3z=14$$

OR

Use power method to find largest eigen value and its corresponding eigen vector

$$\begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$$

5. a. Solve  $\frac{dy}{dx} = \frac{y}{x}$ ,  $y(1)=2$ , at  $x=1.5$  using the RK-2 method. [7]

b. Solve  $y'' + y = x$ ,  $y(0)=0$ ,  $y(1)=2$  and find  $y(0.75)$  by shooting method. [8]

6. a. Solve the Laplace equation  $\nabla^2 u=0$ ,  $0 \leq x \leq 1$ ,  $0 \leq y \leq 1$  with boundary conditions:  $(0,y) = 0$ ,  $u(x,0) = 0$ ,  $u(1,y) = 100$ ,  $u(x,1) = 100$  and  $h = 1/3$ . [7]

b. Solve the Poisson equation  $\nabla^2 u = 2x^2y^2$  over the square region  $0 \leq x \leq 3$  and  $0 \leq y \leq 3$ , given  $(x,y)=0$  on boundary and  $h=1$ . [8]

7. Write short notes on any two: (2\*5=10)

- What is interpolation and curve fitting? Write its application and difference.
- Why iterative method is better than direct method for solving system of linear equations? How gauss seidal method is different than Jacobi method?
- Code of false position method.

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**NEPAL COLLEGE OF INFORMATION TECHNOLOGY**  
**Assessment Fall/Spring 2025**

Level: Bachelor

Year : 2025

Program: BE SE\_Com (D\_M)

Full Marks: 100

Course: Numerical methods

Pass Marks: 45

Semester: II

Time : 2 hrs.

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

*The figures in the margin indicate full marks.*

*Attempt all the questions.*

1. (a) Solve:  $\log x - \cos x = 0$  by secant method correct to four decimal places. 7

- (b) Solve:  $3x + \sin x - e^x = 0$  by Newton- Raphson method correct to four decimal places. 8

2. (a) From the following table, estimate the number of students who obtained the marks between 60 and 65: 8

Marks	30-40	40-50	50-60	60-70	70-80
No of Students	31	42	51	35	31

- (b) The following are data from steam table: 7

Temperature t	140	150	160	170	180
Pressure P	3.685	4.854	6.302	8.076	10.225

Using Newton's formula, find pressure of the steam for t=145.

OR

Find the second degree least square curve to the following observations

x	0	1	2	4	
y	-1	3	9	27	

3. a) Evaluate  $\int_{0.2}^{1.5} e^{-x^2} dx$  by Romberg method.

8

b) Evaluate  $\int_{-1.5}^{2.7} x^4 \sin(x) dx$  by Gaussian two and three-point formula.

7

4. a)

$$3x + 2y + 7z = 32$$

$$\text{Solve : } 2x + 3y + z = 40$$

8

$$3x + 4y + z = 56$$

By Crout's method.

b) Find dominant Eigen value and corresponding Eigen vector of the matrix

$$\begin{bmatrix} 1 & 4 & 4 \\ 4 & 1 & 8 \\ 4 & 8 & 1 \end{bmatrix}$$

$$x + 10y + z = 28$$

7

5. a) Solve:  $10x + y - z = 11.19$

7

$$-x + y + 10z = 35.61$$

By Gauss-Seidal method.

b) The mathematical model of an electric circuit is given by

the equation  $0.25 \frac{d^2Q}{dt^2} + 3 \frac{dQ}{dt} + 5Q = 24 \sin 20t$  with  $Q=0$  and

8

$\frac{dQ}{dt} = 0$  at  $t=0$ . Using Range Kutta fourth order method find

$Q$  and  $\frac{dQ}{dt}$  when  $t=0.2$

6. a) Solve:  $\frac{dy}{dx} = \sin x + y, y(0) = 1$  for  $y(1)$  by Heun's method taking  $h=0.5$

7

b) Solve:  $\nabla^2 u = -10(x^2 + y^2)$  over the square mesh with sides 8

$x=0=y$ ,  $x=3=y$  with  $u=0$  on the Boundary and  $h=1$ .

7. Write short notes on: (Any two) 2×5

- a) Classification of second order partial differential equations.
- b) Cubic spline interpolating polynomial
- c) Convergence of fixed point iterative method.

## Nepal Engineering College

### Final Assessment

Level:	Bachelor	Year:	2025
Programme:	Computer	Full Marks:	100
Year/Part:	II/II	Pass Marks:	45
Subject:	Numerical Methods	Time:	3 hrs

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ The figures in the margin indicate full marks.
- ✓ Attempt all the questions.

1. a. Find the root of  $x \log x - \sin x = 2$  correct upto 4 decimal places using Bisection Method. [7]
- b. What is Convergence and rate of convergence in Numerical Computation? Solve  $x^3 - x - 11 = 0$  correct upto 4 decimal places using fixed point iteration method. [8]
2. a. What is a cubic spline? Use cubic spline interpolation to evaluate  $f(1.5)$  from following data: [7]

x	1	2	3	4
$y=f(x)$	1	5	11	8
- b. Using Divided Difference Interpolation technique, evaluate  $y(7)$  from following data. [8]

x	2	3	6	9	10
$y=f(x)$	11	22	31	12	9
3. a. The following table gives the displacement,  $x$  (cms) of an object at various of time,  $t$  (seconds). Find the velocity and acceleration of the object at  $t = 1.6$  sec. Using suitable interpolation method. [7]

t	1.0	1.2	1.4	1.6	1.8
x	9.0	9.5	10.2	11.0	13.2
- b. Evaluate the integral  $\int_0^6 \frac{\sin x}{1+x} dx$  using Simpson's 1/3 and 3/8 rules. Also comment on your answer. [8]
- a. Solve the following system of linear equation using Gauss Elimination with Partial Pivoting. [7]
$$a + 2b + 3c - d = 10$$

$$2a + 3b - 3c - d = 1$$

$$2a - b + 2c + 3d = 7$$

$$3a + 2b - 4c + 3d = 2$$

- b. Solve the following system of linear equation using LU Factorization method. [8]

$$2x + 4y - 6z = 8$$

$$x + 3y + z = 10$$

$$2x - 4y - 2z = -12$$

5. a. Find the largest Eigen value and corresponding Eigen vector for following matrix.

$$\begin{bmatrix} 2 & 5 & 1 \\ 5 & -2 & 3 \\ 1 & 3 & 10 \end{bmatrix} \quad [7]$$

- b. Solve the following differential equation using RK-2 method

$y'' - 4y' + 4y = e^{3x}$ ,  $y(0) = 0$ ,  $y'(0) = -2$  at  $x=2$  taking step-size = 1. [8]

6. a. Solve the following BVP using shooting method

$$y'' + xy' + y = 3x^2 + 2, y(0) = 0, y(1) = 1 \text{ and } h = 0.25 \quad [7]$$

- b. Solve the equation  $U_{xx} + U_{yy} = 0$  over the square mesh with side  $x=0=y$ ,  $x=3=y$  with  $u=0$  on boundary and mesh length=1. [8]

7. Write short notes on: (Any Two)

$2*5=10$

- a. Errors in numerical calculations

- b. Gauss Jacobi method of iteration

- c. Algorithm of RK-1

**POKHARA ENGINEERING COLLEGE**  
**ASSESSMENT EXAM**

Level: Bachelor

Semester – Fall

Year : 2025

Programme: BE

Full Marks: 100

Course: Numerical Methods

Pass Marks: 45

Time : 3hrs.

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

*The figures in the margin indicate full marks.*

**Attempt all the questions.**

1. a) Find the root of the equation  $f(x) = x^3 - 2x - 5$  with accuracy of 0.08% by using Bisection method. 7  
 b) Estimate the root of the equation  $f(x) = 3x + \sin x - e^x$  using Secant method. 8
2. a) Use appropriate method of interpolation to get  $f(3)$  from given table. 8

x	0	1	2	4	5	6
$f(x)$	1.0	14	15	5	6	19

2. b) Use least square method for the following set of data to fit a parabolic curve and find  $f(2)$ . 7

X	0	1	2	3	4
Y	-4	-1	4	11	20

3. a) Evaluate the integral  $I = \int_0^{\frac{\pi}{2}} \sin x dx$ . Compare the result in both conditions for Simpson 1/3 and 3/8 rule. 7

- b) The following data gives corresponding values of distance(D) travelled by a car at various time interval (T). 8

T	5	6	7	8	9
D	10	14.5	19.5	25.5	32

Find the velocity and acceleration at  $T = 5, 7$ .

3. a) Using power method, find the smallest Eigen value and Eigen vector 8

of the following matrix.  $A = \begin{bmatrix} -2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$

b. Find the inverse of matrix using L.U Decomposition method [A]= 7

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

4. a) Use the Heun's method to estimate at  $x=2$  for  $dy/dx = 2Y/X$  and  $y(1)=2$ . Assume  $h=0.25$ . 8

b) Solve the given differential equation for  $y(0.25)$  using R-K 4<sup>th</sup> order method:

$$10 d^2y/dx^2 + (dy/dx)^2 + 6x = 0 \text{ with } y(0)=1 \text{ and } Y'(0)=0 \text{ take } h=0.2$$

5. a) Torsion on a square bar of side 15cm<sup>2</sup> 15cm. If two of the sides are held at 100°C and the other two sides are held at 0°C. Calculate the steady state temperature at interior points. Assume a grid size of 5cm \* 5cm. 8

b) Solve the following system by using complete pivoting:

$$\begin{aligned} 2x_1 + 7x_2 + 3x_3 &= 5 \\ 3x_1 + 4x_2 + 9x_3 &= 15 \\ 2x_1 + 3x_2 + x_3 &= 9 \end{aligned}$$

6. Write short notes on any two: 2×5

- a) Error in Numerical method
- b) Cubic Spline.
- c) Laplacian equation

**POKHARA UNIVERSITY  
FACULTY OF SCIENCE & TECHNOLOGY  
SCHOOL OF ENGINEERING**

Exam	Final Internal Examination 2025 Spring		
Level	B.E.	F M	100
Program	BoCE & BSE	PM	45
Year/ Part	II/II	Time	3 Hrs

**Subject: Numerical Methods**

Candidates are required to give answers in their own words as far as practicable.  
The figure in the margin indicates full marks.

**Attempt all the questions.**

1.a) Find the real root of  $e^x - 2x - 1 = 0$  using the bisection method. 7

b) Find the root of the equation  $x^3 - 2x + 5 = 0$ , correct to four places of decimal using fixed point iterative method. 8

2.a) Find the missing value from the following table using Lagrange's interpolation formula:

x:	1	2	4	5	6
f(x):	14 <del>y</del>	15 <del>y</del>	5 <del>y</del>	- <del>y</del>	9

7

b) Find the polynomial f(x) and hence find f(6) from the following table, using Newton's divided difference

x	3	7	9	10
f(x)	160	120	72	63

8

3. a) The following data gives the melting point of an alloy of lead and zinc, t is the temperature in degrees Celsius and P is the percentage of lead in the alloy. Using Newton's interpolation formula, find the melting point of an alloy containing 75% lead.

P:	40	50	60	70	80
t:	184	204	226	250	276

7

b) Growth of bacteria (N) in culture after t hours is given in the following table:

t	1	2	3	4	5
N	130	150	175	190	240

Find the equation to best fitting curve of the form  $N = ab^t$  to the data and estimate N when t = 0.

8

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4.a) Evaluate the integral using the Gaussian 2-point and 3-point formula  $\int_2^5 \frac{\sin x + e^x}{1+x} dx$ . 7

b) Solve by Doolittle's method:  $3x + 2y + 7z = 4$ ,  $2x + 3y + z = 5$ ,  $3x + 4y + z = 7$ . 8

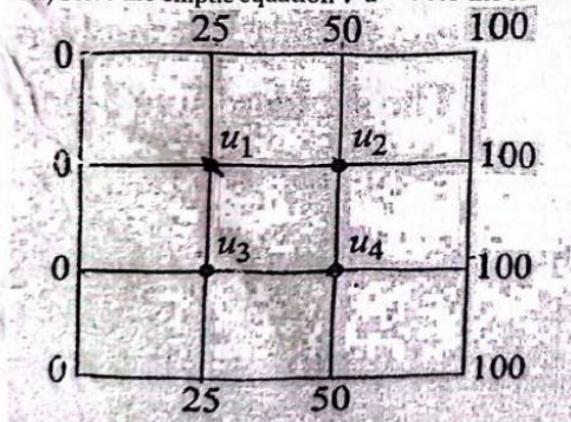
OR

Find the largest (dominant) eigenvalue and corresponding eigenvector of the matrix by the power method  $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ . 8

5.a) Solve the IVP by using the RK-4 method:  $y' = \frac{x^2 + y^2}{x+y}$ ,  $y(0) = 1$  with step size 0.2 for  $y(0.4)$ . 7

b) Solve the second order differential equation using RK-2 method:  $y'' + 2y' - 3y = 0$ ,  $y(0) = 1$ ,  $y'(0) = 1$  with step size 0.2, for  $y(0.4)$ . 8

6.a) Solve the elliptic equation  $\nabla^2 u = 0$  for the following square, using the Gauss-Seidel method



OR

Solve the equation  $\nabla^2 u = -8xy$  over the square domain  $0 < x < 1$ ,  $0 < y < 1$ , given that  $u(0, y) = 0$ ,  $u(x, 0) = 0$ ,  $u(1, y) = 100$ ,  $u(x, 1) = 100$  and mesh length  $h = \frac{1}{3}$ . 7

b) Solve the heat equation  $u_t = u_{xx}$ ,  $0 \leq x \leq 1$ ,  $0 \leq t \leq 0.1$  with boundary conditions  $u(0, t) = 0 = u(1, t)$  and initial condition  $u(x, 0) = \sin \pi x$ , taking  $h = 0.2$  and  $\alpha = \frac{1}{2}$ . 8

**7. Write a short note on any two: (2×5 = 10)**

- a) Importance and use of numerical methods in science and engineering.
- b) Errors in numerical computation
- c) Partial differential equations

## UNITED TECHNICAL COLLEGE

Level: Bachelor                      Semester: Spring                      Year : 2025  
 Programme: BE                        Full Marks : 50  
 Course: Numerical Methods              Pass Marks : 23  
    Time : 1.5 hrs.

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

**Attempt any four questions. Q.N. 7 is compulsory.**

- 1 a Find the positive root of the equation  $x^2 \sin x - e^x + 2 = 0$  correct to 3 decimal places using Bisection method      7
- b Evaluate the real root of  $f(x) = 4 \sin(x) - e^x$ , using Newton's Raphson Method. The absolute error of root in consecutive iteration should be less than 0.01%.      8
- 2 a Estimate  $f(1.732)$  and  $f(2.646)$  from following set of data using Newton's divided difference interpolation.      7

x	-2	-1	0	1	2	3
$f(x)$	64	-5.5	-10	-9.5	56	366.5

- b Fit an exponential function of the type  $y = ae^{bx}$  to the following data.      8

x	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 Using Gauss 2-point and 3-point formula evaluate  $\int_2^4 (x^4 + 1) dx$       7
- b Using Romberg integration method evaluate  $\int_0^1 \frac{1}{1+x} dx$       8
- 4 a Solve the differential equation within  $0 \leq x \leq 0.5$  using RK 4<sup>th</sup> order method.      7

$$20 \frac{d^2y}{dx^2} + 2 \frac{dy}{dx} - 4y = 5, y(0) = 0, y'(0) = 0. \text{ Take } h=0.25.$$

- b Find the distance moved by a particle and its acceleration at the end of 4 seconds, if the time versus velocity data is as follows. 8

t:	0	1	3	4
v:	21	15	12	12

- 5 a Find out the largest Eigen value and corresponding Eigen vector from the following square matrix 7

$$\begin{bmatrix} 2 & 2 & 1 \\ 0 & 2 & 0 \\ 0 & 3 & 1 \end{bmatrix}$$

- b Solve the system of equations by applying gauss- seidel method 8

$$2x - 7y - 10z = -17$$

$$5x + y + 3z = 14$$

$$x + 10y + 9z = 7$$

- 6 a Solve the poisson's equation  $U_{xx} + U_{yy} = 243(x^2 + y^2)$  over 7  
a square domain  $0 \leq x \leq 1, 0 \leq y \leq 1$  with step size  $h = \frac{1}{3}$   
with  $u = 100$  on the boundary.

- b Given that  $y' = x + y^2, y(0)=1$ . Calculate the second approximation and hence fine the value at  $x=0.5$  using Picard's method. 8

7 Attempt Any One (5×1=5)

- a Lagrange's Interpolation
- b Algorithm of Simpson's 3/8 Method
- c Algorithm of Gauss Jordan Method

**National Academy of Science and Technology**  
*(Affiliated to Pokhara University)*  
 Dhangadhi, Kailali

**Pre University Examinations**

Level: Bachelor

Semester: IV\_Spring

Year : 2025

Program: B.E. Computer

F.M. : 100

Course: Numerical Methods

P.M. : 45

Time : 3 hrs.

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

**Attempt all the questions.**

1. a) Find a real root of the equation  $x^3 - 2x - 5 = 0$  with an accuracy of at least 0.0001 using Newton's method. [7]

b) Write a difference between secant method and false position method.

Using secant method find a root of the equation  $3x + \sin x - e^x = 0$ , correct to three decimal places. [1+7]

2. a) From the following table, find the number of students who obtain marks between 40 and 45 using suitable interpolation formula. [7]

Marks	30-40	40-50	50-60	60-70	70-80
No. of students	31	42	51	35	31

- b) The pressure and volume of a gas are related by the equation  $PV^\alpha = \beta$ ,  $\alpha$  and  $\beta$  being constants. Fit this equation to the following data. [8]

P	0.5	1.0	1.5	2.0	2.5
V	1.62	1.00	0.75	0.62	0.52

3. a) Evaluate the integral  $\int_0^{\pi/2} \frac{\cos x}{\sqrt{1+\sin x}} dx$  using Gaussian quadrature formula with  $n = 2$  and  $n = 3$ . [8]

- b) Solve the following system of linear equations using Gauss-Seidel method: [7]

$$x + 10y + 4z = 6; \quad 9x + 2y - 4z = 6; \quad 2x - 4y + 10z = -15.$$

4. a) Solve the following system of equations using factorization method. [8]

$$2x + y + z = 4; \quad 4x + 2y + 3z = 4; \quad x - y + z = 0.$$

- b) Using power method, find the dominant eigen value and corresponding eigen vector of the matrix: [7]

$$\begin{pmatrix} 1 & -3 & 2 \\ 4 & 4 & -1 \\ 6 & 3 & 5 \end{pmatrix}$$

5. a) Using Runge-Kutta method of order four, solve  $\frac{dy}{dx} = y + \sin x$ ,

with  $y(0) = 1$  in the interval  $0 \leq x \leq 1$ . Take  $h = 0.5$ . [7]

- b) Solve the initial value problem

$$y'' + 3y' + 2y = e^{2t}, y(0) = 1 \text{ and } y'(0) = 1 \text{ in the interval } [0, 1]$$

using RK-2 method with  $h=0.5$  [8]

6. a) Solve the equation  $f_{xx} + f_{yy} = 4x^2y^2$  over the square domain  $0 \leq x \leq 3$  and  $0 \leq y \leq 3$  with  $f = 50$  on the boundary and mesh length  $h = 1$  using Gauss-Seidel method correct to two decimal places. [8]

- b) Find the  $dy/dx$  at  $x = 1$  using the data: [7]

x	1	1.2	1.4	1.6	1.8
y	9	9.5	10.2	11.0	12.2

7. Attempt (Any two)  $[2 \times 5 = 10]$

- i) Using Euler's method solve the equation  $y' = x^2 + y$ ,  $y(0) = 1$ , in the interval  $0 \leq x \leq 1$  with  $h = 0.25$ .
- ii) If  $x = 1.3506217$  is rounded off to five decimal places, calculate the absolute and relative errors.
- iii) Write short notes on ill conditioned system with an example.

# Rapti Engineering College

(Affiliated to Pokhara University)

Ghorahi Sub-Metropolitan-16 Saniambapur, Sarra, Dang

Final Internal Examination-2080

Level: Bachelor

Year : 2025

Program: Bachelor of Computer Engineering

Full Marks: 100

Semester: IV

Pass Marks: 45

Subject: Numerical Methods

Time: 3 hrs.

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

*Attempt all the questions.*

1. a) Find the root of the equation  $x\sin x + \cos x = 0$  correct upto three decimal digits. Using closed end method 8  
 b) Find the square root of  $\sqrt{17}$ , using Newton method. 7

2. a) Given values

x	5	7	11	13	17
f(x)	250	392	1452	2366	5202

Calculate f(15) suitable interpolation 7

- b) The pressure and volume of gas are related by the equation  $PV^Y = K$ , Y and K are constants. Fit this equation to the following set of observation :

P (kg/cm <sup>2</sup> )	0.5	1.0	1.5	2.0	2.5	3.0
V( liters)	1.62	1.00	0.75	0.62	0.52	0.46

3. A) Evaluate :

$$\int_0^6 \frac{dx}{1+x^2}$$
 By using

- i) Trapezoidal rule
- ii) Simpson's  $\frac{1}{3}$  rule
- iii) Simpson's  $\frac{3}{8}$

8

7

B) Solve the integration by Romberg integration.

$$\int_0^1 \frac{dx}{1+x}$$

8

4. a) Solve the following system of linear equation by using dolittle LU decomposition method

7

$$3x_1 + 2x_2 + x_3 = 10$$

$$2x_1 + 3x_2 + 2x_3 = 14$$

$$x_1 + 2x_2 + 3x_3 = 14$$

b) Find the largest eigen value and corresponding eigen vector by power method

8

$$A = \begin{bmatrix} 1 & 3 & 2 \\ 3 & -5 & 2 \\ 1 & -3 & 10 \end{bmatrix}$$

5. a) Applying R-K-4 method to solve  $y(0.2)$  for the given equation  $\frac{d^2y}{dx^2} + x\frac{dy}{dx} - y = 0$  given that  $y=1$  and  $\frac{dy}{dx} = 0$  when  $x=0$

8

b) Solve the following equation using Shooting method

7

$$\frac{d^2y}{dx^2} = 6x, y(1)=2 \text{ and } y(2)=9$$

6. a) Solve the Poisson equation  $\nabla^2 = 2x^2y^2$  over the square domain  $0 \leq x \leq 3$  and  $0 \leq y \leq 3$  with  $f=0$  on the boundary and  $h=1$ .

8

b) Solve the system of linear equation using Gauss elimination method

7

$$x+2y+3z=6$$

$$2x+3y+5z=10$$

$$2x-y+3z=4$$

7 Write short notes on: (any two) 2\*5

a) Shooting method

b) Explain in brief the error in numerical calculations

c) ILL conditioned matrix .

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