

**POKHARA UNIVERSITY**

Level: Bachelor

Semester – Spring

Year: 2020

Program: BE

Full Marks: 70

Course: Numerical Methods

Pass Marks: 31.5

Time: 2 hrs.

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

*The figures in the margin indicate full marks.*

**Attempt all the questions.**

**Group - A: (5×10=50)**

Q. N. 1 Which one do you prefer: bracketing or non bracketing methods for solving nonlinear equations? Using a root bracketing method, find a positive real roots of the equation  $x^3 - 3x + 1 = 0$ , correct to 4 decimal places.

Q. N. 2 Monthly faculty salary in three universities is given below: Assuming that the salary for particular category is same in all the universities, calculate the salary of each category of faculty by using appropriate method

Department	Number of Faculty			Total Salary (in thousands)
	Professor	Asst. Professor	Lecturer	
P	2	2	4	60
Q	3	1	2	50
R	1	4	3	60

**OR**

Using an iterative method, solve the system correct to three decimal places:

$$-3x_1 + 22x_2 + 2x_3 = 47$$

$$5x_1 + x_3 + 20x_3 = 67$$

$$45x_1 + 2x_2 + 3x_3 = 58$$

Given a reason for the choice of your method. Write name of any two other iterative methods which can be used to solve the given system.

Q. N. 3 The angular displacement  $\theta$  of simple pendulum is given by equation  $\frac{d^2\theta}{dt^2} + \frac{g}{l} \sin \theta = 0$

where  $l = 98\text{cm}$  and  $g = 980\text{cm/sec}^2$ . If  $\theta = 0.2$  and  $\frac{d\theta}{dt} = 4.47$  at  $t=0$ , use any numerical

method to find  $\theta$  and  $\frac{d\theta}{dt}$  when  $t=1$  with step size  $h=0.2$ .

- Q. N. 4 What Gauss Legendre integration? How does it improve the accuracy of integration? Using 3-point formulas evaluate:

$$\int_2^4 (x^4 + 1) dx$$

- Q. N. 5 Consider a steel plate of size 15cm×15cm. If two of the sides are held at 100°C and the other adjacent sides are held at 0°C. What is the steady state temperature at interior points, assuming a grid size of 5cm×5cm.

**Group - B: (1×20=20)**

- Q. N. 6 a) Solve the initial value problem  $y'' + 3y' + 2y = e^{2t}$ ,  $y(0) = 1$  and  $y'(0) = 1$  in the interval  $[0,1]$  using Runge-Kutta method of order four with  $h=0.5$ . 14+6  
b) Write an iteration formula to find the reciprocal of a natural number  $N$  using Newton's method. Using the formula find the reciprocal of 17 correct to 3 decimal places.

*Best of Luck!*