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**PRESIDENCY UNIVERSITY  
BENGALURU**

**SCHOOL OF ENGINEERING  
END TERM EXAMINATION - MAY 2023**

**Semester :** Semester IV - 2022

**Course Code :** MAT2003

**Course Name :** Sem IV - MAT2003 - Numerical Methods for Engineers

**Program :** B.Tech - All Programs

**Date :** 7-JUN-2023

**Time :** 9.30AM - 12.30PM

**Max Marks :** 100

**Weightage :** 50%

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**Instructions:**

- (i) Read all questions carefully and answer accordingly.
  - (ii) Question paper consists of 3 parts.
  - (iii) Scientific and non-programmable calculator are permitted.
  - (iv) Do not write any information on the question paper other than Roll Number.
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**PART A**

**ANSWER ALL THE QUESTIONS**

**(5 X 4 = 20M)**

1. State the formula of Trapezoidal rule and Simpson's 1/3 rule for the function  $y = f(x)$  taking the values  $y_0, y_1, \dots, y_n$  corresponding to  $x_0, x_1, \dots, x_n$ .  
(CO2) [Knowledge]
2. Define the backward and central finite difference approximations for the first order partial derivative  $\frac{\partial u}{\partial y}$ .  
(CO3) [Knowledge]
3. Define an algebraic equation and give two examples.  
(CO1) [Knowledge]
4. For the differential equation  $dy/dx = f(x, y), y(x_0) = y_0$ , outline the formula for  $K_2$  and  $K_3$  from Runge-Kutta 4th order method.  
(CO3) [Knowledge]
5. State the conditions to classify the Second order partial differential equations and give one example for Elliptic PDE.  
(CO3) [Knowledge]

**PART B**

**ANSWER ALL THE QUESTIONS**

**(5 X 10 = 50M)**

6. Predict the value of the integral  $\int_0^6 \frac{dx}{1+x^2}$  by taking 6 equal strips using  
(a) Trapezoidal rule  
(b) Simpson's 3/8th rule

(CO2) [Comprehension]

7. Predict the area corresponding to the diameter 105 using the appropriate interpolation formula, where A is an area of a circle and D is corresponding diameter (D) given by the following table

D:	80	85	90	95	100
A:	5026	5674	6362	7088	7854

(CO2) [Comprehension]

8. Obtain the solution of the system of equations  $20x+y-2z=17$ ,  $3x+20y-z=-18$ ,  $2x-3y+20z=25$  by using Gauss Seidel iteration method correct to three decimal places. Carry out three iterations.

(CO1) [Comprehension]

9. Given  $\frac{dy}{dx} = x^3 + y$ ,  $y(0)=2$ . Estimate  $y(0.2)$  by Runge-Kutta method of fourth order.

(CO3) [Comprehension]

10. A curve passes through the points (0, 18), (1, 10), (3, -10) and (6, 90). Estimate the slope of the curve at  $x=2$  by Lagrange's interpolation formula.

(CO2) [Comprehension]

**PART C**

**ANSWER ALL THE QUESTIONS**

**(2 X 15 = 30M)**

11. Solve the following system of equations using LU decomposition method,  
 $x_1 + x_2 + x_3 = 1$ ,  $4x_1 + 3x_2 - x_3 = 6$ ,  $3x_1 + 5x_2 + 3x_3 = 4$ .

(CO1) [Application]

12. Solve  $\frac{dy}{dx} = x^2 + y$ ,  $y(0) = 1$  at  $x = 0.1$  and  $x = 0.2$  using modified Euler's method, taking  $h = 0.1$

(CO3) [Application]