GALGOTIAS UNIVERSITY

ADMISSION NUMBER

School of Basic Sciences

Master of Science in Mathematics
Semester End Examination - Jun 2024

Duration : 180 Minutes
Max Marks : 100

Sem II - C1PM205B - Advanced Numerical Analysis

General Instructions
Answer to the specific question asked
Draw neat, labelled diagrams wherever necessary
Approved data hand books are allowed subject to verification by the Invigilator

1) Find the absolute, relative, percentage error if the number $X = 0.00545828$ is Rounded off to four decimal places — K1 (3)

2) Using Taylor's series method, find the value of y at x=0.1 and 0.2, where $\frac{dy}{dx} = x + y$, $y(0) = 1$ — K2 (4)

3) Evaluate $I = \int_0^1 \frac{x^2}{1+x^3} dx$, Use simpson's 1/3rd rule and h=0.25 — K2 (6)

4) Find $\frac{dy}{dx}$ at x=1 from the following table. — K3 (6)

x	1	1.1	1.2	1.3
y	0.841	0.891	0.932	0.963

5) The velocity v (km/min) of a moped which starts from rest, is given at fixed intervals of time t (min) as follows. Estimate approximately distance covered in 20 minutes. — K3 (6)

t :	2	4	6	8	10	12	14	16	18	20
v :	10	18	25	29	32	20	11	5	2	0

6) Find the polynomial f(x) by using Lagrange's formula and hence find f(3) for — K3 (9)

x :	0	1	2	5
f(x) :	2	3	12	147

7) Find the derivative of f(x) at x=0.4 from the following table: — K3 (9)

x	0.1	0.2	0.3	0.4
f(x)	1.10517	1.22140	1.34986	1.49182

8) Fit a least square line to the data in following table using x as the independent variable — K4 (8)

X	3	5	6	8	9	11
Y	2	3	4	6	5	8

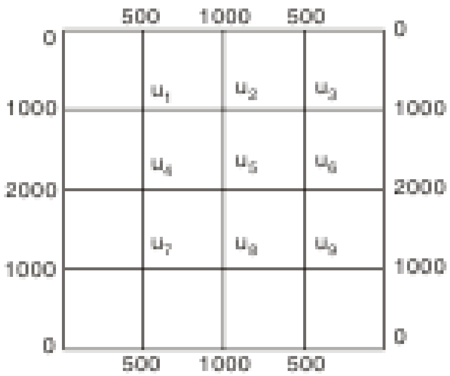
9) **Given** $\frac{dy}{dx} = x^2(1 + y)$ and y(1)=1,y(1.1)=1.233,y(1.2)=1.548,y(1.3)=1.979, Evaluate y(1.4) by Adams-Bashforthmethod — K4 (12)

10) Transform the matrix $M = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ to tri diagonal form by Given's method. K5 (10)

11) Apply Milne's method, to find a solution of $\frac{dy}{dx} = x^3 + y$ at y(0.8) Given that y(0.2)=2.073,y(0.4)=2.452,y(0.6)=3.023. K5 (15)

OR

Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ by Liebman's iteration process for the domain of the figure, given below: K5 (15)



12) Determine the Hermite interpolating polynomial from the following table K6 (12)

x	0	1	2
f(x)	0	1	0
f'(x)	0	0	0

OR

Solve the equation $u_{xx} + u_{yy} = 0$ for the square mesh with boundary values as shown in following figure K6 (12)