Progressive Education Society's

Modern College of Arts, Science & Commerce Ganeshkhind, Pune – 16, NEP 2020 (Autonomous)

End Semester Examination: March/April 2025

***Total No. of Questions**: 3/14* ***Total No. of Pages**: 02*

Second Year (Computer Science)

CMAT24201: Numerical Techniques

(Semester IV)

Program: BSc Comp05 **Credits: 2**
Program (Specific):B.Sc. Computer Science **Course Type: Minor**
Class: S.Y.B.Sc(Comp. Sci.) **Max. Marks: 30**
Course Code: CMAT24201

Instructions to the candidates:

1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Draw a well labelled diagram wherever necessary.*

Q.1) Answer the following. (Any 5 out of 7) [10 Marks]

i) Round off the number 75.34501 to five significant digits and find the corresponding relative error.

ii) Prove that $\Delta = E - 1$ by usual notations.

iii) Round off the following numbers to 4 decimal places .

a) 28.53216 b) 3.8759

iv) Given that $\frac{dy}{dx} = y^2 - x$ with $y(0)$ =1. Find $y(0.1)$ by Euler's method.(Take h=0.1)

v) Given f(1) = 7, f(2) = 10, f(3) = 13, f(4)= 16, f(5)=19. Construct the Newton's Backward difference table.

vi) Does the equation $4x - e^x = 0$ have a real root in the interval (2, 3)? Justify.

vii) Find $\int_0^1 f(x)dx$ using Trapezoidal rule for the following data.

x	0	0.2	0.4	0.6	0.8
y	0	0.008	0.064	0.216	0.512

Q.2) Answer the following. (Any 3 out of 5) [12 Marks]

i) Find the real root of the equation x^3 - 9x + 1 = 0 that lies between 2 and 4 using the Regula Falsi Method correct up to 3 decimal places. (2 iterations)

ii) Find the real root of the equation log x - cos x =0 that lies between 1 and 2 by Newton Raphson Method correct up to 3 decimal places. Take x_0 = 1.5.

P.T.O.

iii) Find y at x = 1.5 by applying Newton Gregory Forward interpolation formula from the following data.

x	1	2	3	4	5
y	2	4	8	16	32

iv) Compute the divided difference table for the following data.

x	4	5	7	10	11
f (x)	48	100	294	900	1210

Hence, find f(6).

v) Evaluate $\int_0^1 \frac{dx}{1+x}$, using Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule (Take h=0.25).

Q.3) Answer the following. (Any 1 out of 2) [08 Marks]

i) Solve $\frac{dy}{dx} = 1 + y^2$ with y (0) =0. Find y(0.2) and y(0.4) using the Runge - Kutta method of fourth order.

ii) a) Find a polynomial f(x) for the following data using the Langranges Interpolation formula.

x	0	1	3	4
y	-12	0	6	12

b) Prove that $\delta = E^{1/2} - E^{-1/2}$