1312N966

Candidate's Seat No :_____

IMSc CS Sem.-7 Examination

Computer Oriented Numerical Methods

Time : 3-00 Hours] December-2024 [Max. Marks : 70

Instructions:

- Write both the Sections in the separate answer book.
- Both Sections have equal weightage

SECTION - I

Q.1 Answer briefly: (6)

a) The number of strips required in Simpson's 3/8 rule is a multiple of _____.

b) For the solution of differential equations, Euler's method is preferred over Taylor's series because _____

c) Use Descartes' Rule to identify number of positive and negative roots of $2x^7 - x^5 + 4x^3 - 5 = 0$

Q.2 a) Find a real root of the equation $x^3 - 2x - 5 = 0$ by the method of false position correct to two decimal places between 2 and 3. (8)

Q.2 b) Find the root of the following using Fixed Point Method $xe^x = 1$ starting with $x_0 = 1$ correct to two decimal places (7)

OR

Q.2 a) Fit a curve of the form $y = ae^{bx}$ to the following data: (7)

X	0	1	2	3
Y	1.05	2.10	3.85	8.30

Q.2 b) Fit a straight line to the following data and compute y when x = 150: (8)

X	50	70	100	120
Y	12	15	21	25

Q. 3 Attempt any two (14)

a) Explain the advantages and disadvantages of Bisection Method.

b) Explain the predictor-corrector methods.

c) Explain the different sources of error.

SECTION - II

Q. 4 Answer any two of the following: (6)

a) Use Simpson's 1/3 rule to find $\int_0^1 \frac{1}{1+x^2} dx$ using 4 intervals

b) The table below shows the temperature f (x) as a function of time:

x	1	2	3	4	5	6	7
f(x)	81	75	80	83	78	70	60

Use Trapezoidal rule to estimate $\int_1^7 f(x)dx$

c) Evaluate $\int_{-1}^1 \frac{1}{1+x^2} dx$ using Gauss formula for $n = 2$.

(P.T.O)

Q.5 a) Obtain the cubic spline for the following data given that $M_0 = M_3 = 0$ (15)

X	0	1	2	3
Y	2	-6	-8	2

OR

Q.5 a) Find the values of y when $x = 160$ for the following data: (8)

X	100	150	200	250	300	350	400
Y	10.63	13.03	15.04	16.81	18.42	19.90	21.27

Q.5 b) Given the following values evaluate $f(9)$, using *Lagrange's formula* (7)

X	5	7	11	13	17
Y	150	392	1452	2366	5202

Q. 6 Attempt any two (14)

a) Solve $y' = x + y$, $y(0) = 1$ by Taylor's series method. Hence find the values of y at $x = 0.1$ and $x = 0.2$ with h = 0.1

b) Given $\frac{dy}{dx} = \frac{y-x}{y+x}$
with initial condition y(0) = 1; find y for x = 0.1 by Euler's method using h = 0.02

c) Apply the Runge-Kutta method to find the approximate value of y for x = 0.1, in steps of 0.1, if $dy/dx = x + y^2$, y = 1 where x = 0.