Seat Number: - ____________

Duration: $2^{1/2}$ Hrs — FYIT- G220A23NMS -(09) — Marks: - 75

Note: - 1) All questions are compulsory.
2) Figures to the right indicate maximum marks.

Q.1. Attempt any three from the following: (15M)

1) What is a simple mathematical model? Explain. CO1(R)
2) Explain the following: (a) Absolute error (b) Relative error CO1(R)
3) Explain the term Round-off error. CO1(R)
4) Find the approximate root of $x^3 - x - 4 = 0$, by Bisection method in the interval of [1, 2]. (Perform upto three iterations). CO2(U)
5) Round-off 0.987250 correct to four significant figures and find out absolute, relative and percentage error. CO1(U)
6) Explain the term significant digits, with suitable examples. CO1(R)

Q.2. Attempt any three from the following: (15M)

1) Solve the equation, $x^3 + 2x^2 - 8 = 0$, using False-Position method by three iterations. CO2(U)
2) Using Newton-Raphson method, find the approximate root of the equation, $x^3 - 3x - 5 = 0$. CO2(U)
3) Find the real root of the equation x3 - 5x + 1 = 0 lies in the interval [0, 1]. Perform four iterations using the secant method. CO2(U)
4) using Newton's backward difference interpolation formula . Find f(9) from the following data. CO2(U)

x	0	5	10	15	20	25
f(x)	7	11	14	18	24	32

5) With the help of Newton's forward difference interpolation method, estimate the population of a town for the year 1895. CO2(U)

Year	1891	1901	1911	1921	1931
Population in Thousands	46	66	81	93	103

6) Using Lagrange's Interpolation formula to find the value of y when x = 0.5. From the following. CO2(U)

x	0	1	2
y	1	4	6

Q.3. Attempt any three from the following: (15M)

1) Use Gauss-Jordan, method to solve the following equation. CO3(U)

$2x_1 + 3x_2 - 4x_3 = 1$
$5x_1 + 9x_2 + 3x_3 = 17$
$-8x_1 - 2x_2 + x_3 = -9$

2) Solve the following system using Gauss-Seidel method.(Perform two iterations) CO3(U)

$10x + y + z = 12$
$2x + 10y + z = 13$
$x + y + 5z = 7$ (Perform two iterations)

3) Find $\frac{dy}{dx}$ at x = 0.1. From the following table. CO3(U)

x	0.1	0.2	0.3	0.4
y	0.9975	0.9900	0.9776	0.9604

4) Evaluate $\int_{0.6}^{2} y\,dx$, where y is given by the following table. CO3(U)

x	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0
y	1.23	1.58	2.03	4.32	6.25	8.36	10.23	12.45

5) Evaluate $\int_0^1 \frac{1}{1+x} dx$ by dividing the interval of integration into 8 equal parts, using Simpson's $\frac{1}{3}^{rd}$ rule. CO3(U)

6) Evaluate $\int_0^6 \frac{e^x}{1+x}\, dx$ approximately using Simpson's $\frac{3}{8}^{th}$ rule, take n = 6. CO3(U)

Q.4. Attempt any three from the following: **(15M)**

1) Fit a straight line for the following data. CO4(U)

x	0	1	2	3	4
y	1	1.8	3.3	4.5	6.3

2) List down the properties of Regression Coefficients. CO4(R)

3) Use Taylor's series method, for the equation $\frac{dy}{dx} = x^2 y$ and y(1) = 1, to find the value of y at x = 1.1, h= 0.1. CO4(U)

4) Find the coefficient of correlation when two regression equations are x = -0.2y + 4.2 and y = -0.8x + 8.4. CO4(U)

5) Using least square method fit a parabola for the following data. CO4(U)

x	1	2	3	4
y	6	11	18	27

6) Use second order Runge-Kutta method to approximate y when x = 0.1 given that $\frac{dy}{dx} = x + y$ and y(0) = 1. CO4(U)

Q.5. Attempt any three from the following: **(15M)**

1) Classify the following equations: CO5(U)

(i) $(1+x)^2 \frac{\partial^2 u}{\partial x^2} + (5 + 2x^2)\frac{\partial^2 u}{\partial x\, \partial t} + (4 + x^2)\frac{\partial^2 u}{\partial t^2} = 0$

(ii) $\frac{\partial^2 u}{\partial x^2} + 4\frac{\partial^2 u}{\partial x\, \partial y} + 4\frac{\partial^2 u}{\partial y^2} - \frac{\partial u}{\partial x} + 2\frac{\partial u}{\partial y} = 0$

2) Explain, classification of partial differential equations of the second order. CO5(R)

3) Solve the difference approximations to Partial's derivatives. CO5(R)

4) Solve the following LPP, CO5(U)

Maximum, Z - 4x + 10y

Subject to, $2x + 6y \leq 18$

$4x + 2y \leq 26$

$x \geq 0$ & $y \geq 0$

5) Solve the LPP, graphically CO5(U)

Max, z = 10x + 5y

Subject to, $x + y \leq 5$

$2x + y \leq 6$

$x \geq 0$ & $y \geq 0$.

6) A gardener wanted to prepare a pesticide using two solutions A and b. The cost of 1 litre of solution A is ₹ 2 and the cost of 1 litre of solution B is ₹ 3. He wanted to prepare atleast 20 litre of pesticide. The quantity of solution A available in a shop is 12 litre and solution B is 15 litre. How many litre of pesticide, the gardener should prepare so as to minimize the total cost? Formulate the above LPP. CO5(A)

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