

Note : Answer Five questions only

Q1: Using Laplace Transform, find the solution of the following differential equation:

$$y'' - 3y' + 2y = 4e^{2t} \quad y(0) = -3 \text{ \& } y'(0) = 5$$

(20 marks)

Q2: Use the appropriate interpolation formula to calculate the value of $y(1.5)$ and $y'(1.5)$

from the following data:

x	1	2	3	4	5	6	7	8
y	1	8	27	64	125	216	343	512

(20 marks)

Q3: Solve the following initial-boundary value problem for temperature in a homogenous rod with isolated sides and no internal heat generation.

$$\frac{\partial^2 u}{\partial x^2} = \frac{1}{k} \frac{\partial u}{\partial t} \quad \text{over } 0 \leq x \leq L \quad \text{and } t \geq 0$$

$$B.C: \frac{\partial u}{\partial x}(0, t) = \frac{\partial u}{\partial x}(L, t) = 0$$

$$I.C: u(x, 0) = x$$

(20 marks)

Q4: A) Solve the following system of linear equations by Gauss elimination method:

$$-x_1 + x_2 + 2x_3 = 2$$

$$3x_1 - x_2 + x_3 = 6$$

$$-x_1 + 3x_2 + 4x_3 = 4$$

B) Find the inverse of the following matrix A by cofactor method.

$$A = \begin{bmatrix} -1 & 1 & 2 \\ 3 & -1 & 1 \\ -1 & 3 & 4 \end{bmatrix}$$

(20 marks)

Q5: Using fourth order Runge-Kutta method, find the solution of $y(0.2)$ of the initial value problem $y' = -2xy^2$ with $y(0)=1$ and $h=0.1$

(20 marks)

Q6: A) Fit a straight line to the following experimental data:

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

B) Using Simpson's one-third rule, evaluate the integral

$$\int_0^{0.5} e^{-x^2} dx \quad \text{by taking } h = 0.1$$

(20 marks)

.....**GOOD LUCK**.....