[This question paper contains 3 printed pages.]

Your Roll No. .....

3207 **J**

MEE

Paper—EE.502

COMPUTATIONAL MATHEMATICS

Time : 3 *Hours* *Maximum Marks* : 100

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt ***all*** *the questions by selecting any two parts from each question.*

All *questions carry equal marks.*

1. (a) Solve the following system by Crout's method :

$$x+2y+z=4,\ 2x-3y-z=-3,\ 3x+y+2z=3.$$

(b) Solve the following by Gauss-Jordan method correct upto two decimal places :

$$x_1+2x_2+x_3=8,\ 2x_1+3x_2+4x_3=20,\ 4x_1+3x_2+2x_3=16.$$

(c) Find the largest eigen value and the corresponding eigen vector of the matrix by power method :

$$\begin{bmatrix} 1 & 2 & 0 \\ 2 & 1 & 0 \\ 0 & 0 & -1 \end{bmatrix}$$

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2. (a) Compute the missing values in the following table :

x :	45	50	55	60	65
y :	3.0	–	2.0	–	–2.4

(b) Determine $\log_{10}1044$ from the data given below :

x :	1000	1010	1020	1030	1040	1050
$\log_{10}x$:	3	3.00432	3.00860	3.01283	3.01703	3.60119

(c) Show that the nth difference of a polynomial of degree n is constant and $(n + 1)$th difference will be zero.

3. (a) Show that :

(i) $\frac{\Delta^2}{E}x^3 = 6xh^2$

(ii) $E^{1/2} = \left(\frac{1}{2} + \frac{\delta^2}{4}\right)^{1/2} + \frac{\delta}{2}$

(b) The following table contains the path $y = f(t)$ traversed in time t by a point moving in a straight line. Find the velocity and acceleration of the point at time $t = 0.04$.

time t (sec) :	0	0.01	0.02	0.03	0.04	0.05
path $y(t)$ (cm) :	0	1.519	6.031	13.397	23.396	35.721

(c) Prove that :

$$u_x = u_{x-1} + \Delta u_{x-2} + \Delta^2 u_{x-3} + \ldots\ldots + \Delta^{n-1} u_{x-n} + \Delta^n u_{x-n-1}$$

4. (a) Calculate the value of $\int_0^{\pi/2} \sin x \, dx$ by Simpson's 1/3 rule, using 11 ordinates upto three decimal places.

(b) Using Runge-Kutta method, solve $y'' = xy' - y^2$, for $x = 0.2$ correct to four decimal places, given that at $x = 0$, $y = .1$, $y' = 0$.

(c) Use Milne's method to find $y(0.3)$ from $y' = x^2 + y^2, y(0) = 1$ correct upto three decimal places taking h = 0.05.

5. (a) Show that the principal part of the error in the interval $[x_0, x_4]$ in Boole's rule is $-\frac{8h^7}{945} y^{(vi)}$.

(b) Solve the Poisson's equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 8x^2y^2$ for the square mesh with $u(x, y) = 0$ on the boundary and mesh length is 1 as shown in figure 1, upto 3 decimal places in three iterations :

u_1	u_2	u_3	
u_4	u_5	u_6	
u_7	u_8	u_9	

Figure 1

(c) Solve the elliptic equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ for the following square mesh with boundary values as shown in figure 2. Iterate until the maximum difference between two successive values at any point is less than 0.001.

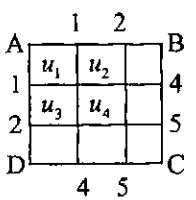

Figure 2