Instru & Control

COLLEGE OF ENGINEERING, PUNE

(An Autonomous Institute of Govt. of Maharashtra)

END SEMESTER EXAMINATION

(IE 312) Computing Algorithms and Applications

Programme: T. Y. B. Tech (Instrumentation and Control)

Year: 2012-13 Semester II

Duration: 3 hr Max. Marks: 50

Instructions:

1. Figures to right indicate full marks
2. Draw neat figures wherever required
3. Use of Programmable Calculator is not allowed

Q.1 Solve All

1. Solve the system of equations by Gaussian elimination method **10**

$$x - 2y = 0; \qquad 2x + y = 5$$

2. Evaluate $\int_1^4 f(x)dx$ from the table by Simpson's 3/8 rule

x	1	2	3	4
$f(x)$	1	8	27	64

3. Find $y(1,1)$, given $\frac{dy}{dx} = x + y, \qquad y(1) = 2$ by Euler's method

4. From Taylors series of expansion derive the formula for the second order derivative using forward differences.

5. Determine the highest real root of

$$f(x) = 2x^3 - 11.7x^2 + 11.7x - 5$$

Using Newton-Raphson method. (assume $x_0 = 3$)

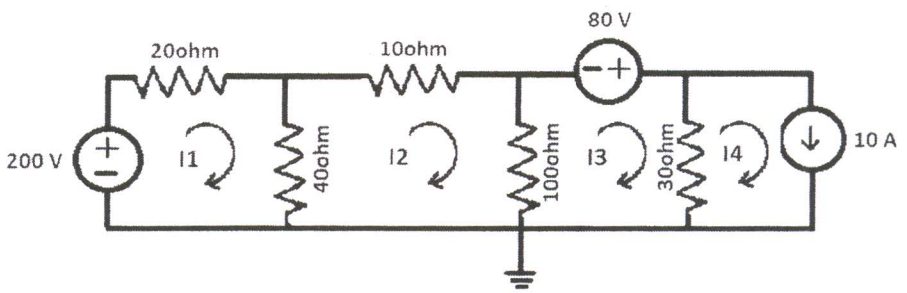
Q. 2 Using Gauss-Jordan Method, find the inverse A^{-1} of the given matrix **10**

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

Compare the performance of Gauss elimination, Gauss-Jordan and LU factorization methods for number of floating point operations involved in solving set of linear equations.

Q.2. Solve any three

A) For the circuit given below, using LU factorization solve for I_1, I_2, I_3 **05**



B) Using classical fourth order Runge-Kutta method solve **05**

$$f(x, y) = 4e^{0.8x} - 0.5y$$

Using $h = 0.5$ with $y(0) = 2$ from $x = 0$ *to* 0.5

C) Write Newton-Cotes formula for numerical integration for a function $f(x)$ represented by a third order polynomial. **05**

Use Romberg integration to evaluate

$$I = \int_1^2 (2x + \frac{3}{x})^2 dx$$

To an accuracy of $\varepsilon_s = 0.5\%$

D) Find the real positive root of $3x - cosx - 1 = 0$ by appropriate method correct to 6 decimal places **05**

Q.3 **Solve all**

A) Use Euler's method to solve **05**

$$\frac{d^2y}{dt^2} - 0.5t + y = 0$$

Where $y(0) = 2$ and $y'(0) = 0$. Solve from $x = 0$ *to* 4 using $h = 0.1$

B) From the following table of half yearly premium for policies maturing at different ages, estimate the premium for policies maturing at age 45 and 63. **05**

Age (x)	45	50	55	60	65
Premium (y)	114.84	96.16	83.32	74.48	68.48

OR

Using Lagrange's interpolation formula, find $y(10)$ from the following table

x	5	6	9	11
y	12	13	14	16

C) The table below gives the velocity $\boldsymbol{V}$ of a moving particle at time $\boldsymbol{t}$ seconds. Find the distance covered by the particle in 12 seconds and also the acceleration at $\boldsymbol{t} = \mathbf{2}$ seconds, using Simpson's rule. **05**

$\boldsymbol{t}$	0	2	4	6	8	10	12
$\boldsymbol{V}$	4	6	16	34	60	94	136