1. (a) Use the Gaussian elimination method to solve the system of the following equation

$$9r + 3s + 4t = 7$$
$$4r + 3s + 4t = 8$$
$$r + s + t = 3$$

6½ marks

   (b) The three major materials (x,y,z) use in the bridge construction required that the

   following systems of equation must be satisfied.

$$3x + 2y - z = 3$$
$$x - y + 2z = 4$$
$$2x + 3y - z = 3$$

   Use the Gauss – Jordan method to find the value of (x,y,z)
            6marks

   (c) Use LU Decomposition method to solve the system of equation given by

$$w_1 + w_2 - w_3 = 2$$
$$w_1 + 2w_2 + w_3 = 6$$
$$2w_1 - w_2 + w_3 = 1$$

5marks

2.   (a)   Use the Jacobi iterative method to solve the following system of equation

$$2w_1 - w_2 - 3w_3 = 20$$
$$w_1 - 6w_2 - w_3 = 41$$
$$3w_1 + 6w_2 + 2w_3 = 70$$

6½ marks

(b)   Use the bisection method, find a zero of the function $f(x) = 2x^3 - 3x^2 - 2x + 3$ between the points 1.4 and 1.7, taking the tolerance to be $|x_{j+1} - x_j| \le 10^{-5}$
6marks

(c)   By means of Newton's backward interpolation formula, find the quartic polynomial that fits the following table.2a.

Table 2a

x	0	2	4	6	8
y	8	17	230	1230	3972

5marks

3(a)   A student obtained the data in table 3a in the laboratory. By making use of the method of least squares, find the relationship between x and t.

x	1.2	2.3	3.0	3.8	4.7	5.9
t	1.1	2.1	3.1	4.0	4.9	5.9

Table 3a

6½ marks

(b)   The distance covered by a rocket from t=8 to t=30 is given by

$$x = \int_8^{30} (2000 \ln\left[\frac{140000}{140000 - 2100t}\right] - 9.8t)dt$$

use Simpson's 1/3rd rule to find the approximate value of x   5 marks

(c)   Use the trapezoid rule to solve for $\int_0^2 e^{x^2}$ using n=4 subintervals   6 marks

4(a)   Use Simpson's 3/8 rule to approximate the following definite integral,

$$\int_0^1 \frac{dx}{\sqrt{(x^2+1)(3x^2+4)}}$$

with $n=6$:

6½ marks

(b)   Use Romberg's method to compute $\int_0^1 \frac{dx}{1+x^2}$ correct to 4 places
6marks

(c)   Evaluate the integral $\int_0^{\frac{\pi}{2}} x \sin x dx$ (where x is in radians) with a step-size of $\Delta x = \frac{\pi}{16}$, using Simpson's one-third rule
5marks

5 (a) Using Eulers's modified method, obtain a solution of the equation $\frac{dv}{du} = u + |\sqrt{v}|$, with initial condition v=1 at u=0 for the range $0 \le u \le 0.6$ in steps of 0.2   6½ marks

(b)   Use the fourth-order Runge-Kutta method to integrate $f(x,y) = -2x^3 + 12x^2 - 20x + 8.5$ using a step size of $h = 0.5$ and an initial condition of $y = 1$ at $x = 0$ 6marks

(c)   Integrate $4e^{0.8x} - 0.5y$ by fourth-order Runge-Kutta method using $h = 0.5$ with $y(0) = 2$ from $x = 0$ to 0.5.

5marks

6. (a) Write a short notes on each of the following Methods of Solving First Order Ordinary Differential
   Equations
     (i) Picard's Method (ii) Euler Method   (iii) Runge-Kutta Methods

9 marks

(b) Write a short notes on each of the following numerical integration methods
     (i) The Trapezoidal Rule (ii) Simpson's three-eighth rule (iii) Romberg's method

8 ½

4marks