

**GUJARAT TECHNOLOGICAL UNIVERSITY****ME - SEMESTER– I (New course)• REMEDIAL EXAMINATION – SUMMER 2015****Subject Code: 2710210****Date:12/05/2015****Subject Name: NUMERICAL METHODS FOR COMPUTER ENGINEERING****Time: 10:30 am to 1:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

**Q.1 (a)** Define Errors. If 0.333 is the approximate value of  $1/3$ , find the absolute, relative and percentage errors. **07**

**(b)** Explain Mathematical modeling with example. What is the role of Mathematical modeling in engineering problem solving? **07**

**Q.2 (a)** Find the real root of the equation  $x \log_{10} x = 1.2$  by Bisection method correct to four decimal places. **07**

**(b)** Use the method of successive approximation to find a positive root between 0 and 1 of the equation  $xe^x = 1$ . **07**

**OR**

**(b)** Find the smaller root of the equation  $x^2 - 32x + 1 = 0$  correct to four significant figures. **07**

**Q.3 (a)** The population of a town was as given. Estimate the population for the year 1925. **07**

Year (x):	1891	1901	1911	1921	1931
Population (y):	46	66	81	93	101
(in thousands)					

**(b)** Fit a parabola of second degree to the following data **07**

X:	0	1	2	3	4
Y:	1	1.8	1.3	2.5	2.3

**OR**

**Q.3 (a)** From the following table of half-yearly premium for policies maturing at different ages, estimate the premium for a policy maturing at the age of 63: **07**

Age:	45	50	55	60	65
Premium:	114.84	96.16	83.32	74.48	68.48
(in dollars)					

**(b)** Find the solution to the following system of equations using the Gauss-Seidel method. **07**

$$12x_1 + 3x_2 - 5x_3 = 1$$

$$x_1 + 5x_2 + 3x_3 = 28$$

$$3x_1 + 7x_2 + 13x_3 = 76$$

Use  $\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$  as the initial guess and conduct six iterations.

**Q.4 (a)** Evaluate  $\int_0^1 \frac{1}{1+x^2} dx$  by using **07**

(i) Simpson's one-third rule taking  $h=1/4$  (ii) Simpson's three-eighth rule taking  $h=1/6$   
Hence compute an approximate value of in each case.

- (b) What do we mean by the 'Best Fit'? What is the meaning of 'Least Square'? 07

Find the best line fit for the following record.

X:	1.0	1.2	1.4	1.6
Y:	0	0.182	0.336	0.47

Using your 'Best Line Fit' equation find Y when X = 1.8

**OR**

- Q.4 (a)** Given that  $dy/dx = \log_{10}(x + y)$  with the initial condition that  $y = 1$  when  $x = 0$ . Find  $y$  for  $x = 0.2$  and  $x = 0.5$  using Euler's modified formula. 07

- (b) A solid of revolution is formed by rotating about x-axis, the lines  $x = 0$  and  $x = 1$  and a curve through the points with the following coordinates. 07

x:	0	0.25	0.5	0.75	1
y:	1	0.9896	0.9589	0.9089	0.8415

Estimate the volume of the solid formed using Simpson's rule.

- Q.5 (a)** Given  $dy/dx = y \log x$ ,  $y(0) = 2$ . Find  $y(0.1)$  and  $y(0.2)$  correct to four decimal places (use both II and IV order Runge Kutta methods). 07

- (b) Consider Table 1 with 14 measurements of the concentration of sodium chlorate produced in a chemical reactor operated at a pH of 7.0. 07

**Table 1 Chlorate ion concentration in mmol/cm<sup>3</sup>**

12.0	15.0	14.1	15.9	11.5	14.8	11.2	13.7	15.9	12.6	14.3	12.6	12.1	14.8
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Use the data in Table 1 to calculate the

- a) mean chlorate concentration   b) sample standard deviation   c) variance

**OR**

- Q.5 (a)** Solve using Secant method  $f(x) = \cos x - xe^x = 0$  07

- (b) By the method of least squares, find the straight line that best fits the following data: 07

x:	1	2	3	4	5
y:	14	27	40	55	68

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