

GUJARAT TECHNOLOGICAL UNIVERSITY**M. E. - SEMESTER – I • EXAMINATION – WINTER 2012****Subject code: 711507N****Date: 16-01-2013****Subject Name: Numerical Methods****Time: 02.30 pm – 05.00 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)** Find the root of the following equations using bisection method upto three decimal places, $x^3 - 4x - 9 = 0$ **07**
- (b)** Find the real root of equation $1.2 - x \log_{10} x = 0$ by false position method correct to fourth place. **07**

- Q.2 (a)** The following table gives the marks secured by students **07**

Range of marks	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80
No. of students	31	42	51	35	31

Find the number of students who got marks between 40 and 45.

- (b)** The following table gives velocity 'v' of particle in time 't'. Find the distance moved by particle in 12 seconds and also acceleration at $t = 2$ secs **07**

Time 't' in sec.	0	2	4	6	8	10	12
Velocity 'v' in m/s	4	6	16	34	60	94	136

OR

- (b)** Evaluate integration of function $\log_e(1 + x^2)$ over a range of 0 to 1.2 using trapezoidal rule **07**

- Q.3 (a)** Determine the largest Eigen value and corresponding Eigen vector of following matrix **07**

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

- (b)** A cantilever beam of span 1m carries a point load 10kN at its end. If the beam has rectangular cross section 20 x 100mm and is made up of mild steel, find the deflection of beam at 0.25L, 0.5L, 0.75L and L from fixed end. Use Finite Difference Method. **07**

OR

- Q.3 (a)** The following values of x and y are obtained in an experiment which follows $y = ax^2 + b \log_{10} x$. Find 'a' and 'b' graphically **07**

x	2.85	3.88	4.66	5.69	6.65	7.77	8.67
y	16.7	26.4	35.1	47.5	60.6	77.7	93.4

- (b)** Variation of x and y are shown in table below. Use method of group **07**

average to determine the constants if variation follows

$$y = a + bx + cx^2.$$

x	87.5	84.0	77.8	63.7	46.7	36.9
y	292	283	270	235	197	181

Q.4 (a) Calculate correlation coefficient from following data **07**

x	50	50	55	60	65	65	65	60	60	60
y	11	13	14	16	16	15	15	14	13	13

(b) From the following data obtain regression line 'y' on 'x'. **07**

x	1	2	3	4	5
y	9	11	5	8	7

OR

Q.4 (a) Write a computer algorithm to solve simultaneous linear equation by Gauss Seidel Method using C++ language. **07**

(b) Solve the following equation using Gauss-Jordan method **07**

$$10x + y + z = 12$$

$$2x + 10y + z = 13$$

$$x + y + 5z = 7$$

Q.5 (a) If $2/3$ is approximated to four digits find, (a) Absolute error **07**
(b) Relative error (c) Relative percentage error

(b) Use Euler's method to obtain approximate value of $y(0.4)$ for the equation $y' = x + y$, $y(0) = 1$ with $h = 0.1$ **07**

OR

Q.5 Write a short note on following **14**

- (a)** Type of errors
- (b)** Various methods of curve fitting
- (c)** Importance of correlation coefficient
- (d)** Usage of numerical method in Structural Engineering
