Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER 2012

Subject code: 714304N **Date: 16-01-2013**

Subject Name: Numerical Methods in Geotechnical Engineering (Elective-I)

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 positive real root of the equation $x - cosx = 0$ using bisection method upto four decimal places between 0 and 1. **07**

(b) Find the real root of equation $x^6 - x^4 - x^3 - 1 = 0$ by method of Regula Falsi correct to fourth place. **07**

Q.2 (a) The marks secured by students of a class are given in following table **07**

Range of marks	30 - 40	40 - 50	50 - 60	60 - 70	70 – 80
No. of students	25	35	22	11	7

Find the number of students who got marks (i) more than 55 (ii) between 36 and 45.

(b) A river is 40m wide and has survey data of distance from one bank and respective water depth in following table. Estimate the area of cross section of river **07**

Distance 'x' in m	0	5	10	15	20	25	30	35	40
Depth 'd' in m	0	3	6	8	7	6	4	3	0

OR

(b) Evaluate integration of function $f(x) = \sin x - \log_e x + e^x$ over a range of 0.2 to 1.4 using Simpson's one third rule using h = 0.1 **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 simply supported beam of span L carries UDL of intensity 'w' over its entire span. If the beam has constant flexural stiffness, derive expression for deflection of beam at 0.25L, 0.5L and 0.75L from one end. Use Finite Difference Method. **07**

Q.3 (a) The values of x and y obtained in an experiment are shown in following table. The phenomenon follows law $y = ae^{bx}$. Calculate the values of 'a' and 'b' graphically **07**

x	2.30	3.10	4.00	4.92	5.91	7.20
y	33.0	39.1	50.3	67.2	85.6	125.0

(b) Fit a second degree parabola $y = a + b\,x + c\,x^2$ in following data using method of least square **07**

x	1.00	1.50	2.00	2.50	3.00	3.50	4.00
y	1.1	1.3	1.6	2.0	2.7	3.4	4.1

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

x	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000
y	0.30	0.29	0.29	0.25	0.24	0.24	0.24	0.29	0.18	0.15

(b) From the following data obtain regression line 'x' on 'y'. **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 Triangularization Method using C++ language. **07**

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

$2x + 8y + 2z = 14$

$6x + 6y - z = 13$

$2x - y + 2z = 5$

Q.5 **(a)** If 6/7 is approximated to four digits find, (a) Absolute error (b) Relative error (c) Relative percentage error **07**

(b) Solve equation $y' = 1 - y$ using Euler's method with initial condition x = 0, y = 0 and tabulate result at x = 0.1, 0.2, 0.3 **07**

OR

Q.5 Write a short note on following (any four) **14**

(a) Interpolation methods

(b) Least square principle

(c) Usage of correlation and regression in experimental results

(d) Laplace equation

(e) Banded solution of simultaneous equation

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