Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER • 2013

Subject code: 714304N **Date: 06-01-2014**

Subject Name: Numerical Methods in Geotechnical Engineering

Time: 10.30 am – 01.00 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)** Analyse a fixed supported uniform square plate for uniformly distributed load by finite difference method. Take grid step L/4 in both directions. **07**

(b) Find the real root of equation $x^6 - x^4 - x^3 - 1 = 0$ by any suitable method 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	22	36	42	14	17

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

(b) Find the positive real root of the equation $x - \cos x = 0$ using bisection method upto four decimal places between 0 and 1. **07**

OR

(b) Evaluate integration of function $f(x) = \sin x - \log_e x + e^x$ over a range of 0.4 to 1.6 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) Using the finite difference method, compute the deflection at L/4 interval of a simply supported beam subjected to central point load and full span UDL. Take EI constant. **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	34.0	39.6	53.3	68.2	86.6	129.0

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

x	10	15	20	25	30	35	40
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	110	120	130	140	150	160	170	180	190	200

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	10	20	30	40	50
y	8	13	6	8	6

OR

Q.4 **(a)** Write a computer algorithm to solve simultaneous linear equation by any suitable method using C++ language. **07**

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

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

$6x + 6y - z = 13$

$2x - y + 2z = 5$

Q.5 **(a)** If 7/8 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 **14**

(a) Type of errors

(b) Various methods of curve fitting

(c) Importance of correlation coefficient

(d) Usage of numerical method in Geotechnical Engineering