Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

ME Semester –I Examination Feb. - 2012

Subject code: 714304N **Date: 21/02/2012**

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) Write the significance of curve fitting in structural engineering and fit line y =a+ bx in following data **07**

X	2	4	6	8
Y	0.34	0.36	0.46	0.64

(b) Apply Gauss elimination method to solve the equations **07**

X + 4y – z = -5 ; x + y – 6z = -12 ; 3x – y – z = 4

Q.2 (a) Observed pressure of flow of a gas by varying velocity is given in table below. Find the pressure at velocity 12m/sec and 43m/sec. **07**

v (m/sec)	10	20	30	40	50
p (Pascal)	1.1	2	4.4	7.9	15.4

(b) Apply Newton's forward interpolation formula to determine f(1.22) **07**

x	1	1.1	1.2	1.3	1.4
y	0.841	0.891	0.932	0.963	0.985

OR

(b) Solve above problem using Stirling's formula. **07**

Q.3 (a) The velocity of a vehicle 'V' which starts from rest at different time interval is as follows. Find the approximate difference covered by the vehicle in 20minutes **07**

T (min)	2	4	6	8	10	12	14	16	18	20
V (kmph)	10	18	25	29	32	20	11	5	2	0

(b) Relation between distance 'X' from one end of a beam and displacement measurement 'Y' is as follows **07**

X (m)	1	1.1	1.2	1.3	1.4	1.5	1.6
Y (mm)	7.89	8.403	8.781	9.129	9.451	9.75	10.031

Find (dy/dx) and (d^2y/dx^2) at x = 1.1 and 1.6

OR

Q.3 (a) A relationship between 'x' and 'logx' is as follows **07**

x	4	4.2	4.4	4.6	4.8	5	5.2
log(x)	1.3863	1.4351	1.4816	1.5261	1.5686	1.6094	1.6487

Evaluate ∫log(x) dx over a range of 4 to 5.2 using Simpson's one third rule and Trapezoidal rule.

(b) The following table gives the velocity 'V' of the particle at time 'T'. Find the distance moved by the particle in 10sec and acceleration at 4 seconds. **07**

T (seconds)	0	2	4	6	8	10	12
V (m/sec)	4	6	16	34	60	94	136

Q.4 (a) Solve following equations using Jacobi's method **07**

10x+2y+z = 9; 2x+20y-2z = -44; -2x+3y+10z= 22

(b) Solve following equations using Gauss Seidal method **07**
$5x+2y+z = 12$; $x+4y+2z = 15$; $x+2y+5z= 20$

OR

Q.4 **(a)** Solve following non-linear equations, **07**
$x^2+y = 11$; $y^2+x=7$

(b) Find the largest Eigen-values and corresponding Eigen vector for following matrix, **07**

$$\begin{pmatrix} 1 & 2 & 3 \\ 0 & -4 & 2 \\ 0 & 0 & 7 \end{pmatrix}$$

Q.5 **(a)** If $r = 3h(h^6 - 2)$, find the percentage error in 'r' at h = 1, if percentage error in 'h' is 5. **07**

(b) Use method of least square to fit a curve $y = ae^{bx}$ for given data and find the constants. **07**

x	2.3	3.1	4	4.92	5.91	7.2
y	33	39.1	50.3	67.2	85.6	125

OR

Q.5 Write short note on *any three* of the following, **14**

(a) Laplace transformation
(b) Euler's equation
(c) Correlation and regression
(d) Types of error
(e) Banded solution
(f) Finite difference method

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