Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject code: 714304N **Date: 17-06-2013**

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)** Enlist methods for solution of algebraic and transdental equations and explain any one in brief. **07**

(b) Apply Newtonôs backward interpolation formula to determine f(1.18) **07**

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

Q.2 **(a)** The velocity v in m/s of the rocket measured at ½ second interval is **07**

t(Sec)	0	0.5	1.0	1.5	2.0
V(m/s)	0.000	11.860	26.335	41.075	59.051

Use central difference to approximate the acceleration of the rocket at t= 1.2 sec. and t=1.75 sec.

(b) Find real root of the equation $f(x)=3x^3+10x^2+10x+7=0$ correct to four decimal point using iteration method. **07**

OR

(b) Find real root of the equation 2x = cosx+3 correct to four decimal point using Newton-Raphson method. **07**

Q.3 **(a)** Explain Trapezium rule & mid ordinate rule for numerical integration. **07**

(b) A relationship between ôxô and ôlogxô 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 Ú log(x) dx over a range of 4 to 5.2 using Simpsonôs one third rule .

OR

Q.3 **(a)** Evaluate the sum $S=3^{1/2}+5^{1/2}+7^{1/2}$ to four significant digit and find its absolute and relative error, if each digit are rounded off 2 decimal digits. **07**

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

X	0	2	4
Y	5.012	10	31.62

Q.4 **(a)** Find the largest Eigen-values and corresponding Eigen vector for following matrix using power method, **07**

$$\begin{pmatrix} 1 & 3 & -1 \\ 3 & 2 & -4 \\ -1 & -4 & 10 \end{pmatrix}$$

(b) (i) Write the properties of eigen value **07**

(ii) Define absolute, relative and percentage error

OR

Q.4 **(a)** Fit a second degree parabola in the following data. **07**

$Y=a+bx+cx^2$

X	0.0	1.0	2.0	3.0	4.0
Y	1.0	4.0	10.0	17.0	30.0

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

$$\begin{pmatrix} 1 & 0 & 1 \\ 0 & -6 & 0 \\ 1 & 0 & 1 \end{pmatrix}$$

Q.5 **(a)** Write down the program for Newtonôs forward interpolation method. **07**

(b) Solve following simultaneous equations by Gauss-Seidel method. **07**

X+9y-z=10

2x-y+11z=20

10x-2y+z=12

OR

Q.5 **(a)** Compute deflections at atleast three points, of fixed beam subjected to uniformly distributed load w kN/m on the span L. Use finite difference techniques. **07**

(b) Using finite difference techniques, find out deflections for a simply supported uniform square plate subjected to uniformly distributed load w kN/m^2 **07**

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