

Seat No.: \_\_\_\_\_

Enrolment No. \_\_\_\_\_

**GUJARAT TECHNOLOGICAL UNIVERSITY****M.E –II<sup>st</sup> SEMESTER–EXAMINATION – JULY- 2012****Subject code: 1720110****Date: 14/07/2012****Subject Name: Numerical Methods****Time: 10:30 am – 13:00 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)** Explain: Significant figures, Rounding off. **07**

Find the percentage error in  $V = \frac{1}{2} \left[ \frac{r^2 + h^2}{h} \right]$  if there is 2% error in  $r$  and  $h$ .

**(b)** Using Newton-Raphson method, find a real root of equation  $3x = \cos x + 1$  correct up to three decimal places. **07****Q.2 (a)** The table gives the distance in nautical miles of the visible horizon for the given heights in feet above the earth's surface: **07**

$x$ (height) :	100	150	250	300	350	400
$y$ (distance):	10.63	13.03	15.04	18.42	19.90	21.27

Use an appropriate interpolation formula to find the values of  $y$  when  $x = 218$  ft and  $x = 390$  ft.

**(b)** The following table gives the values of  $x$  and  $y$  : **07**

$x$ :	5	7	11	13	17
$y$ :	150	392	1452	2366	5202

Find the value of  $y$  for  $x = 9$ , using Lagrange's method.

**OR****(b)** Explain Interpolation and Extrapolation. **07**

The pressure  $p$  of wind corresponding to velocity  $v$  is given by the following data. Using Newton's Backward interpolating formula, find  $p$  when  $v = 37$ ,

$v$ :	10	20	30	40
$p$ :	1.1	2	4.4	7.9

**Q.3 (a)** Explain the importance of Gauss- elimination method. And hence solve the system of equations **07**

$$10x - 7y + 3z + 5u = 6; \quad -6x + 8y - z - 4u = 5;$$

$$3x + y + 4z + 11u = 2; \quad 5x - 9y - 2z + 4u = 7.$$

**(b)** Using Gauss- Jordan method, find the inverse of the matrix **07**

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 2 & 2 \\ 5 & 2 & 3 \end{bmatrix}.$$

**OR****Q.3 (a)** Using Gauss-Seidal iteration method, solve the equations: **07**

$$20x + y - 2z = 17; \quad 3x + 20y - z = -18; \quad 2x - 3y + 20z = 25.$$

- (b) If  $P$  is the pull required to lift a load  $W$  by means of a pulley block, find a quadratic form  $P = a + bW + cW^2$  connecting to  $P$  and  $W$ , using the following data: 07

$P$ :	1.0	1.5	2.0	2.5	3.0	3.5	4.0
$W$ :	1.1	1.3	1.6	2.0	2.7	3.4	4.1

- Q.4 (a)** Evaluate  $\int_0^1 \frac{dx}{1+x^2}$  using Trapezoidal Rule taking  $h = 0.25$ . Hence, compute an approximate value of  $\pi$ . 07

- (b) Evaluate  $\int_0^4 e^x dx$  by Simpson's Rules and compare it with actual value. 07

**OR**

- Q.4 (a)** Evaluate  $\int_0^{\pi/2} \sin x dx$  using Trapezoidal rule and Simpson's 1/3 rule taking  $h = \pi/12$ . 07

- (b) Determine the constants  $a$  and  $b$  by the method of least squares such that  $y = a + bx$  fits the following data: 07

$x$ :	10	20	30	40	50
$y$ :	1.5	2.0	4.4	7.9	8.2

- Q.5 (a)** Using Euler's method, find an approximate value of  $y$  corresponding to  $x = 1$  taking step size  $h = 0.1$ , given that  $\frac{dy}{dx} = x + y$  and  $y = 1$  when  $x = 0$ . 07

- (b) Apply Runge-Kutta method of fourth order to find approximate value of  $y$  for  $x = 0.2$ , in step of 0.1, if  $\frac{dy}{dx} = x + y^2$ , given that  $y(0) = 1$ . 07

**OR**

- Q.5 (a)** Solve the following by Euler's modified method:  $\frac{dy}{dx} = \log(x + y)$ ,  $y(0) = 2$  at  $x = 0.6$  with  $h = 0.2$ . 07

- (b) Find by Taylor's series method, the values of  $y$  at  $x = 0.1$  and  $x = 0.4$  to four decimal places from  $\frac{dy}{dx} = x^2y + 2$ ,  $y(0) = 1$ . 07

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