

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY
MCA - SEMESTER– II• EXAMINATION – SUMMER 2016

Subject Code: Computer Oriented Numerical Methods

Date: 30-05-2016

Subject Name: 620005

Time: 10.30a.m. To 01.00p.m.

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) Attempt the following: **07**

1. Define Round off errors.
2. Define Truncation errors.
3. Define Total Numerical errors
4. State Descarte's rule of sign.
5. What is a matrix?
6. State any three types of matrices.
7. State the condition for multiplication of two matrices.

(b) Define error. Explain the types of errors with examples. **07**

Q.2 (a) Write an algorithm to solve a non-linear polynomial equation by Successive Approximation method. **07**

(b) Solve the equation $x^3 - 4x^2 + 5x - 2 = 0$ by Birge-Vieta method taking initial guess as 1.9. **07**

OR

(b) Solve the equation $x^4 - x - 10 = 10$ by Newton Raphson method, taking initial guess as 2.0. **07**

Q.3 (a) Find $y(10)$ from the data given below using Lagrange's interpolation. **07**

x	5	6	9	11
y	12	13	14	16

(b) Find $y(46)$ and $y(63)$ from the below given data using Newton's interpolation: **07**

Age (x)	45	50	55	60	65
Premium (y)	114.84	96.16	83.22	74.48	68.48

OR

Q.3 (a) Obtain cubic spline equation for subinterval $[0,1]$ for the data given in the table: **07**

x	0	1	2	3
f(x)	1	2	33	244

(b) Determine the curve of the form $y = a.x^b$, which is the best fit to the following data according to least square equation. **07**

x	1.0	1.5	2.0	2.5	3.0	3.5
y	0.01	0.405	0.693	0.916	1.098	1.252

Q.4 (a) The table below gives the results of an observation, 'θ' is the observed temperature in degrees centigrade of a vessel of cooling water, 't' is the time in minutes from the beginning of observation. **07**

t	1	3	5	7	9
θ	85.3	74.5	67.0	60.5	54.3

Find the appropriate rate of cooling at $t=3$ and $t=3.5$.

- (b) Find the first two derivatives of ' $x^{1/3}$ ' at $x=50$ and $x=56$ from the table below: 07

x	50	51	52	53	54	55	56
$y = x^{1/3}$	3.6840	3.7084	3.7325	3.7563	3.7798	3.8030	3.8259

OR

- Q.4 (a) A Curve passes through the points (1, 2), (1.5, 2.4), (2.0, 2.7), (2.5, 2.8), (3, 3), (3.5, 2.6) and (4.0, 2.1). Obtain the area bounded by the curve, the X-axis and $x=1$ and $x=4$. 07

- (b) A river is 80 metres wide. The depth 'd' in metres at a distance 'x' metres from one bank is given by the following table. Calculate the area of cross-section of the river using Simpson's 1/3 rule. 07

x (distance in metres)	0	10	20	30	40	50	60	70	80
d (depth in metres)	0	4	7	9	12	15	14	8	3

- Q.5 (a) Use Milne-Simpson's Predictor corrector formula to solve $y' = 2y - y^2$, for $x = 0.2$ and $x = 0.25$ if 07

$$y(0) = 1$$

$$y(0.05) = 1.0499584$$

$$y(0.10) = 1.0996680$$

$$y(0.15) = 1.148850$$

- (b) Solve the following system of linear equations using Gauss-Seidel method: 07

$$2x_1 - 2x_2 + 5x_3 = 13$$

$$2x_1 + 3x_2 + 4x_3 = 20$$

$$3x_1 - x_2 + 3x_3 = 10$$

OR

- Q.5 (a) Solve the following ordinary differential equation using Taylor series method: $y' = y^2 + x$; given that $y(0) = 0$, find $y(0.2)$. 07

- (b) Use Runge Kutta 4th order method to solve $y(0.2)$ and $y(0.4)$ when $y' = (2xy + e^x) / (x^2 + x.e^x)$; given that $y(0) = 0$ and $h = 0.2$. 07
