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## GUJARAT TECHNOLOGICAL UNIVERSITY <br> MCA- II ${ }^{\text {nd }}$ SEMESTER-EXAMINATION -JUNE - 2012

Subject code: $\mathbf{6 2 0 0 0 5}$
Date: 13/06/2012
Subject Name: Computer Oriented Numerical Methods
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) Discuss in brief the concept of bracketing techniques used to find roots of equation. Find real root of equation $x^{3}-9 x+1$ using bisection method. Take the initial guess as 2 and 3. (Perform five iterations only)
(b) Answer the following:

1 State Descarte's rule of sign and apply it to estimate the number of 04 positive roots of the polynomial $f(x)=x^{5}-x^{4}+3 x^{3}+9 x^{2}-x+5$.
2 Explain the reasons why Newton Raphson method should not be 03 considered to find roots of polynomial equation. Which method should be used instead?
Q. 2 (a) Define the terms: Absolute Error, Relative Error, Round Off Error, 07 Truncation Error, Formulation Error, Blunders and Data Uncertainty.
(b) Explain the concept of successive approximation method used to find root of equation. Discuss the convergence of the method using graphical techniques.

## OR

(b) Find the real root of polynomial equation $x^{3}+x-1=0$ using Birge

Vieta method. Take initial guess as 0.5 . (Perform two iterations only)
Q. 3 (a) What do you understand by the term interpolation? Derive Newton's07 Backward Difference interpolation formula.
(b) Given the following data table obtain a best fit for a hyperbolic 07 equation:

| x | 0 | 1 | 2 | 3 | 4 | 5 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| y | 1.00 | 0.50 | 0.33 | 0.25 | 0.20 | 0.17 |

OR
Q. 3 (a) Given the following data table interpolate the data at $\mathrm{x}=301$, using

Lagrange's interpolation technique.

| x | 300 | 304 | 305 |
| :---: | :---: | :---: | :---: |
| y | 2.4771 | 2.4829 | 2.4843 |

(b) What do you understand by regression analysis? Explain in detail how we can fit a straight line.
Q. 4 (a) Given the following table differentiate the function at $\mathrm{x}=0.85$.

| x | 0.50 | 0.75 | 1.00 | 1.25 | 1.50 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathrm{f}(\mathrm{x})$ | 0.13 | 0.42 | 1.00 | 1.95 | 2.35 |

(b) Explain the process of numerical integration. Derive the formula for Simpson's $1 / 3$ rule.

## OR

Q. 4 (a) The population of a city is given in the following table. Find the rate of growth in population in year 2001.

| Year (x) | 1961 | 1971 | 1981 | 1991 | 2001 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Population (y) | 40.62 | 60.80 | 79.95 | 103.56 | 135.65 |

(b) Evaluate the function $\int_{0}^{2.25} \frac{1}{1+x^{2}}$ for $\mathrm{h}=0.25$ using Simpson's $3 / 8$ rule.
Q. 5 (a) Solve the following system using Gauss-Seidel iteration method. (Perform three iterations only).

$$
\begin{aligned}
20 x_{1}+2 x_{2}+x_{3} & =30 \\
x_{1}-40 x_{2}+3 x_{3} & =-80 \\
2 x_{1}-x_{2}+10 x_{3} & =30
\end{aligned}
$$

(b) Find the largest Eigen value and the corresponding Eigen vector of

$$
A=\left[\begin{array}{ccc}
4 & 0 & 2 \\
0 & -1 & 0 \\
2 & 0 & 4
\end{array}\right]
$$

OR
Q. 5 (a) Solve the following system using Gauss elimination with pivoting:

$$
\begin{array}{r}
2 x_{1}+2 x_{2}+x_{3}=6 \\
4 x_{1}+2 x_{2}+3 x_{3}=4 \\
x_{1}-x_{2}+x_{3}=0
\end{array}
$$

(b) Apply Runge-Kutta $4^{\text {th }}$ order method to differential equation
$\frac{d y}{d x}=x+y$, given $\mathrm{y}(1)=5$ and $\mathrm{h}=0.25$ for interval $(1,1.75)$.

