B. Tech.

(SEM. IV) EXAMINATION, 2006-07

COMPUTER BASED NUMERICAL & STATISTICAL TECHNIQUES

Time : 2 Hours]  [Total Marks : 50

Note :  Attempt all the questions.

1  Attempt any four of the following :  \[ 4 \times 3 = 12 \]

(a)  If \( u = 3 \ 9^7 - 6 \ 9 \) find the percentage error in \( u \) at \( 9 = 1 \), if the error in \( 9 \) is 0.05.

(b)  Compute the real root of \( x^3 - 5x + 3 = 0 \) in the interval \([1,2]\) by the Regula falsi method. Perform three iterations only.

(c)  By Newton Raphson method find the positive root of \( f(u) = x - 2 \sin x \).

Choose suitable initial guess and perform three iterations.

(d)  Find the root of the equation

\[ f(u) = x^3 - 3x - 5 = 0 \] which lies between 2 and 3 by the Muller’s method. Perform two iterations only.

V-1034] 1  [Contd...
(e) Apply the quotient – difference method to obtain the approximate roots of the equation.
\[ X^3 - 7x^2 + 10x - 2 = 0. \]

(f) Define rate of convergence. Obtain rate of convergence of Newton Raphson method.

2 Attempt any four of the following: 4x3=12

(a) From the following table, find the number of students who obtained less than 45 marks by method of interpolation:

<table>
<thead>
<tr>
<th>Marks</th>
<th>0-30</th>
<th>31-40</th>
<th>41-50</th>
<th>51-60</th>
<th>61-70</th>
<th>71-80</th>
<th>81-100</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Students</td>
<td>0</td>
<td>31</td>
<td>42</td>
<td>51</td>
<td>35</td>
<td>31</td>
<td>5</td>
</tr>
</tbody>
</table>

(b) The ordinates of the normal curve are given by the following table:

<table>
<thead>
<tr>
<th>( x )</th>
<th>.0</th>
<th>.2</th>
<th>.4</th>
<th>.6</th>
<th>.8</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y )</td>
<td>.3989</td>
<td>.3910</td>
<td>.3683</td>
<td>.3332</td>
<td>.2897</td>
</tr>
</tbody>
</table>

Calculate: (i) \( y(0.25) \) (ii) \( y(0.62) \).

Use Newton’s method of interpolation.

(c) Use stirling formula to find \( y(28) \) given:

<table>
<thead>
<tr>
<th>( x )</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y )</td>
<td>49225</td>
<td>48316</td>
<td>47236</td>
<td>45926</td>
<td>44306</td>
</tr>
</tbody>
</table>

(d) Applying Lagrange’s formula, find the interpolating polynomial \( f(x) \) for the following set of observations:

<table>
<thead>
<tr>
<th>( x )</th>
<th>0</th>
<th>1</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y )</td>
<td>4</td>
<td>3</td>
<td>24</td>
<td>39</td>
</tr>
</tbody>
</table>

Also find \( f(2) \).
(e) By means of Newton’s divided difference formula, find the values of \( f(2) \), \( f(8) \) and \( f(15) \) from the following table.

<table>
<thead>
<tr>
<th>( x )</th>
<th>4</th>
<th>5</th>
<th>7</th>
<th>10</th>
<th>11</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>( f(u) )</td>
<td>48</td>
<td>100</td>
<td>294</td>
<td>900</td>
<td>1210</td>
<td>2028</td>
</tr>
</tbody>
</table>

(f) Differentiate between interpolation and curve fitting.

3 Attempt any two parts: \( 7 \times 2 = 14 \)

(a) Fit a natural cubic spline to the following data:

<table>
<thead>
<tr>
<th>( x )</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y )</td>
<td>11</td>
<td>49</td>
<td>121</td>
</tr>
</tbody>
</table>

Hence compute

(i) \( y(2.5) \) and

(ii) \( y'(2) \)

(b) Find the first and second derivative at 1.1 for the data

<table>
<thead>
<tr>
<th>( x )</th>
<th>1.00</th>
<th>1.2</th>
<th>1.4</th>
<th>1.6</th>
<th>1.8</th>
<th>2.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>( f(u) )</td>
<td>0</td>
<td>.1280</td>
<td>.5440</td>
<td>1.2960</td>
<td>2.432</td>
<td>4.00</td>
</tr>
</tbody>
</table>

(c) Evaluate the integral

\[
\int_{0}^{1} \frac{x^2}{1 + x^3} \, dx
\]

Simpson’s rule taking four equal intervals, and hence find the value of \( \log_e 2 \).
Attempt any two parts: 6x2=12

(a) For a bi variate distribution n = 18,

\[ \sum x^2 = 60, \sum y^2 = 96, \sum x = 12, \sum y = 18, \sum xy = 48 \]

Find the equations of lines of regressions.

(b) Fit the curve \( y = ax^b \) to the following data, using method of least squares.

<table>
<thead>
<tr>
<th>x</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>2.98</td>
<td>4.26</td>
<td>5.21</td>
<td>6.1</td>
<td>6.8</td>
<td>7.5</td>
</tr>
</tbody>
</table>

(c) Write short notes on: 6x2=12

(i) Quality Control Methods

(ii) Multiple Regression Analysis.