II Semester B.C.A. Degree Examination, April/May 2015
(CBCS) (2014 – 15 and Onwards)
Computer Science
BCA 205 : NUMERICAL AND STATISTICAL METHODS

Time : 3 Hours
Max. Marks : 100

Instruction : Answer all Sections.

SECTION – A

1. Answer any ten of the following. (2×10=20 Marks)

1) Multiply \( 5543E12 \times -4111E -15 \).

2) Define :
   i) Truncation error
   ii) Round off error.

3) Write the formula for Newton-Raphson method.

4) Construct the difference table for the following data.

<table>
<thead>
<tr>
<th>( x )</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>( f(x) )</td>
<td>1</td>
<td>3</td>
<td>7</td>
<td>13</td>
<td>21</td>
</tr>
</tbody>
</table>

5) Write Newton's Backward interpolation formula.

6) Explain Doolittle method of solving linear equations of the form \( AX = B \).

7) Find the positive root of the equation \( x^3 - 3x - 5 = 0 \) which lies between 2 and 2.5 by bisection method (use one approximation).

8) From the following data compute the value of harmonic mean.
   85, 70, 10, 75, 500, 8, 42, 250, 40, 36.

9) Define correlation.

10) Write a formula to calculate Arithmetic mean by step deviation method.
11) State Bayes theorem.

12) From a pack of 52 cards, what is the probability of drawing one card that it is either king or queen.

SECTION – B

II. Answer any six of the following. (6x5 = 30 Marks)

13) Find a real root of the equation \( f(x) = x^3 - 5x + 1 = 0 \) lies in the interval (0, 1) perform four iterations of the secant method.

14) Estimate the population during the period 1955 from the following data.

<table>
<thead>
<tr>
<th>Year</th>
<th>1921</th>
<th>1931</th>
<th>1941</th>
<th>1951</th>
<th>1961</th>
<th>1971</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pop. in lakhs</td>
<td>20</td>
<td>24</td>
<td>29</td>
<td>36</td>
<td>46</td>
<td>51</td>
</tr>
</tbody>
</table>

15) Using Lagrange's interpolation formula find the value of \( f(x) \) at \( x = 6 \) from the data.

<table>
<thead>
<tr>
<th>( x )</th>
<th>3</th>
<th>7</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>( f(x) )</td>
<td>168</td>
<td>120</td>
<td>72</td>
<td>63</td>
</tr>
</tbody>
</table>

16) Evaluate \( \int_{0}^{6} \frac{dx}{1 + x^2} \) by Trapizoidal rule by taking \( n = 1 \).

17) By using Simpson's \( \frac{3}{8} \) rule evaluate \( \int_{0}^{3} \frac{dx}{(1+x)^2} \) by taking \( n = 1 \).

18) Solve by Gauss-Seidel method.

\[ 10x + y + z = 12, \quad x + 10y + z = 12, \quad x + y + 10z = 12 \]

19) Solve using Crout's LU decomposition method.

\[ x_1 + x_2 + x_3 = 1 \\
4x_1 + 3x_2 - x_3 = 6 \\
3x_1 + 5x_2 + 3x_3 = 4 \]

20) Determine the single-precision machine representation of the decimal number 52.234375 in both single precision and double precision.
SECTION – C

III. Answer any six of the following. (6×5=30 Marks)

21) Solve by Gauss-elimination method.
   \[ x + 2y + 3z = 6, \quad 2x + 4y + z = 7, \quad 3x + 2y + 9z = 14 \]

22) Find the dominant eigen value of the matrix \( A = \begin{bmatrix} 4 & 2 \\ 1 & 3 \end{bmatrix} \).

23) Solve the system of equations by Gauss-Jacobi method.
   \[ 10 \times + y + z = 12, \quad 2x + 10 \times y + z = 13, \quad 2x + 2y + 10 \times z = 14 \]

24) Use Taylor's series method to find \( y(1.02) \) when \( \frac{dy}{dx} = xy - 1 \) for \( y(1) = 2 \).

25) Solve \( \frac{dy}{dx} = 2x - y \) with \( y(0) = 3 \) by Picard's iterative method upto third approximation.

26) Solve \( \frac{dy}{dx} = xy \), \( y(1) = 2 \) by Runge-Kutta IV order method by taking \( h = 0.2 \).

27) Calculate HM from the following data
   \[ 85, 70, 10, 75, 500, 8, 42, 250, 40, 36 \]

28) A bag \( X \) contains 2 white, 3 red balls and a bag \( Y \) contains 4 white and 5 red balls. One ball is drawn at random from one of the bags and is found to be red. Find the probability that it was drawn from bag \( Y \).

SECTION – D

IV. Answer any four from the following. (4×5=20 Marks)

29) From the following data calculate Arithmetic mean

<table>
<thead>
<tr>
<th>Marks</th>
<th>0 – 10</th>
<th>10 – 20</th>
<th>20 – 30</th>
<th>30 – 40</th>
<th>40 – 50</th>
<th>50 – 60</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Students</td>
<td>10</td>
<td>5</td>
<td>30</td>
<td>25</td>
<td>10</td>
<td>20</td>
</tr>
</tbody>
</table>
30) Compute the standard deviation from the following data.

<table>
<thead>
<tr>
<th>Salaries in thousands</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
<th>70</th>
<th>75</th>
<th>80</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Persons</td>
<td>3</td>
<td>5</td>
<td>8</td>
<td>7</td>
<td>9</td>
<td>7</td>
<td>4</td>
<td>7</td>
</tr>
</tbody>
</table>

31) Calculate Karl Pearson's coefficient of skewness for the following data.
25, 15, 23, 40, 27, 25, 23, 25, 20

32) A die is thrown twice and the sum of the numbers appearing is observed to be 6. What is the conditional probability that the number 4 has appeared at least once?

33) If A and B are two events then prove that 
\[ P(A \mid B) = \frac{P(A) - P(A \cap B)}{1 - P(B)} \]
where \( P(B) \neq 1 \).

34) Fit a normal distribution to the following data.

<table>
<thead>
<tr>
<th>( xi )</th>
<th>5</th>
<th>7</th>
<th>9</th>
<th>11</th>
<th>13</th>
<th>15</th>
<th>17</th>
<th>19</th>
<th>21</th>
<th>23</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>( fi )</td>
<td>2</td>
<td>8</td>
<td>16</td>
<td>23</td>
<td>36</td>
<td>44</td>
<td>39</td>
<td>21</td>
<td>14</td>
<td>16</td>
<td>2</td>
</tr>
</tbody>
</table>