**BRAC UNIVERSITY**

**Department of Computer Science and Engineering**

**CSE330: Numerical Methods  
Final Exam**

**Summer 2015**

**Duration: 2 Hours 20 Minutes, Total Marks: 80**

**THERE ARE FIVE (5) QUESTIONS. ANSWER ANY FOUR (4)**

1. (a) Solve the differential equation given below using the Runge-Kutta 4th order method: [12]

The exact solution for this problem is 8. Find the value of *y* for the range. You must show all the calculations and show the comparison between the exact and approximate values of *y* in a tabular form. The table should be as shown below:

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| --- | --- | --- | --- |
| i | i | i |  |
|  |  |  |  |

(b) Draw the flow chart of the *false position* method for finding the root(s) of a nonlinear equation of degree *n*. [8]

1. (a) Assume that you are given. Find the central difference approximation of the first derivative at . Also find the absolute relative true error for both cases. [8]

(b) Consider Table 1 given below. [12]

Table 1

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Integrate the above data using Simpson’s 1/3 and 3/8 rule. Use Simpson’s 1/3 rule with between and Simpson’s 3/8 rule with between. Show the final integration result.

1. (a) Solve the system of equations below using LU decomposition: [12]

(b) Derive the Newton’s Divided Difference method for a 2nd order polynomial. [8]

1. (a) Using the Trapezoidal rule for Integration, integrate using single segment. Show, in a tabular form, the effect of step size on the value of the integration by considering number of segments = 1, 2 [12]

and 4.

(b) Use the Secant method to estimate the root of with initial estimates *x-1* = - 0.3 and x0 = 0.3. Show your result along with the percentage errors in tabular form for the first three iterations. [8]

1. (a) Derive the formula for finding the values of the linear regression coefficients. Using Table 1, find the coefficient values for linear regression. [12]

(b) Using Table 2, find the value of using 2nd order Lagrange interpolating polynomial method. [8]

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**GOOD LUCK**