# Final Examination

Semester: FALL 2019

### Department of Computer Science and Engineering

Course Title: **Numerical Methods**                    Course Code: **CSE 234**

Level & Term: **L2T3**                                             Sections: ALL

Course Teacher: All

Full Time: **2.0 hours**                                          Full Marks: 4×10=40

Answer any *Four* of the following problems.

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1.  (a) Find a real root of the equation $x^2 + \ln x - 2 = 0$ in $[1, 2]$ correct up to five decimal places by using Newton-Raphson's method. [4]

    (b) Determine the quadratic polynomial $y = a + bx + cx^2$ from the following data using Least squares Method. [6]

| $x$ | 0 | 1 | 2 | 3 |
|-----|---|---|----|----|
| $y$ | 1 | 5 | 10 | 22 |

2.  (a) Form the polynomial $f(x)$ form the table by using Newton's Divided Difference Method and hence estimate $f(4)$. [6]

| $x$ | $-1$ | 0 | 3 | 6 | 7 |
|-----|------|----|----|-----|------|
| $f(x)$ | 3 | $-6$ | 39 | 822 | 1611 |

    (b) Solve the initial value problem $\frac{dy}{dx} = \frac{2y}{x} + x^2 e^x, y(1) = 0$, using Runge-Kutta Method of order four with $h = 0.2$ to approximate $y(1.2)$. [4]

3.  (a) The population of a town is given below in different times. Find the rate of growth of the population in 1921. [6]

| $year(x)$ | 1921 | 1931 | 1941 | 1951 | 1961 |
|-----------|------|------|------|------|------|
| $Population(y)$ (In thousand) | 19.96 | 38.65 | 58.81 | 77.21 | 94.61 |

    (b) Derive General Integral formula or Simpson's three-eight rule for numerical Integration. [4]

4.  Find $y'(x)$ and $y''(x)$ at $x = 0.62$ and the value of x for which y is maximum/minimum. [10]

| $x$ | 0.60 | 0.65 | 0.70 | 0.75 |
|-----|------|------|------|------|
| $y$ | 0.6221 | 0.6155 | 0.6138 | 0.6170 |

5.  (a) Evaluate $\int_{0.2}^{1.4}(\cos x - \ln x)\, dx$ upto three decimal places with step size 0.2, by using Trapezoidal rule and Simpson's 3/8 rule (b) Then find the exact value of the integral and compute the errors and (c) comment. [10]