King Fahd University of Petroleum and Minerals
College of Computer Sciences and Engineering

CISE 301 – Numerical Methods (T152)

Homework # 01 (due date & time: Tuesday 02/02/2016 during class period)

***** Show all your work. No credit will be given if work is not shown! *****

Showing all calculations steps (i.e. final answers alone are not acceptable), solve the following problems:

Problem 1 (15 points): Convert the following binary numbers to decimal:

1. $(10010110)_2$
2. $(10011100.0101)_2$
3. $(110010.1001)_2$

Problem 2 (25 points): Use zero- through fourth-order Taylor series expansions to predict $f(2.0)$ for $f(x) = \ln 2x$ using a base point at $x = 1$. Compute the true percent relative error ε_t for each approximation. Discuss the meaning of the results with respect to the convergence of the error.

Problem 3 (20 points): Use zero- through third-order Taylor series expansions to predict $f(3.0)$ for $f(x) = 20x^3 - 18x^2 + 3x - 27$ using a base point at $x = 1$. Compute the true percent relative error ε_t for each approximation.

Problem 4 (20 points): Obtain the first three non-zero terms of the Taylor series expansions of $\sin(2x)$ about the center of expansion $x = 2\pi$.

Problem 5 (20 points): Find the least number of terms required to compute π as 3.14 (rounded) using the following series:

$$\pi = 4 - \frac{4}{3} + \frac{4}{5} - \frac{4}{7} + \frac{4}{9} - \ldots$$