EML3041 Computational Methods Fall 2023 Week Two: August 28 – September 1 Session 02

## Answer the free-response question on a fresh sheet of paper. Solve the problem as if you were submitting them for a test. Submit at the end of the class.

1) For the base-10 number 3.4, do the following.

a) A hypothetical computer stores base-10 numbers in a fixed-point format in 8-bit binary words. The first 5 bits are used for the integer part, and the last 3 bits are used for the fractional part. How would the base-10 number be represented in this binary format?
b) A hypothetical computer stores base-10 numbers in a floating-point format in 8-bit binary words. The first bit is used for the sign of the number; the second bit is used for the sign of the exponent; the next three bits for the *unbiased* exponent; and the last three bits for the magnitude of the mantissa. How would the base-10 number be represented in this binary format?

c) A hypothetical computer stores base-10 numbers in a **floating-point** format in 8-bit binary words. The first bit is used for the sign of the number, the next four bits for the *biased* exponent, and the last three bits for the magnitude of the mantissa. How would the base-10 number be represented in this binary format?

d) What is the machine epsilon for the computer in part (c)?

e) Show that the binary representation of base-10 number 3.4 in part (c) has an absolute relative true error of less than the machine epsilon.

Answer: Answers are not given intentionally