

CSE330- Numerical Methods
Quiz 01; Fall'24

Grade

Name: Suhif ID: 1930 Section: _____

Marks: 15 points

Time: 20 minutes

Instructions: Answer all questions on the space provided below for each.

Question 1: CO2 (3+3+3 points): Given $\beta = 2$, $m = 3$ and $e \in \{-2, 0, 3\}$. Using Lecture note form answer the following questions:

a) Compute the Machine Epsilon.

$$= \frac{1}{2} \beta^{1-m} = \frac{1}{2} \times 2^{1-3} = \frac{1}{2} 2^{-2} = 2^{-3} = (0.125)_{10}$$

b) Compute the minimum of $|x|$ (non-negative).

Lecture note form: $(0.d_1d_2d_3)_\beta \times \beta^e = (0.1d_2d_3)_\beta \times \beta^e = \underbrace{(0.100)_2}_{|x|} \times 2^{-2}$

c) How many numbers can be represented using this system.

$0.1\underline{d_2}\underline{d_3} \rightarrow 2^2$; exponents = 3; so, $2^2 \times 3 = 12$; total = $\overset{\substack{\uparrow \\ \text{positive} \\ \text{numbers}}}{12} + \overset{\substack{\uparrow \\ \text{negative} \\ \text{numbers}}}{12} = 24$

Question 2: CO3 (6 points): Given a system with $\beta = 2$, $m = 3$, What will be the product of $x = \frac{3}{8}$ and $y = \frac{5}{8}$.

$$x * y = \frac{3}{8} * \frac{5}{8} = \frac{15}{64} = \frac{1}{64} + \frac{2}{64} + \frac{4}{64} + \frac{8}{64}$$

$$= 2^{-6} + 2^{-5} + 2^{-4} + 2^{-3}$$

$$= \underbrace{(0.001111)_2}_{m=3}$$

$m=3$

$$U_b(x * y) = (0.010)_2$$

