Brac University
Department of Computer Science and Engineering
Summer 2025

Name: **10 Marks**
Student ID: **25 Minutes**
Section:

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1. If $\beta = 2$, fraction is of 2 bits exponent is of 3 bits, What will be the non-negative lowest and highest number that can be generated using the Normalized form of floating point representation? N.B: Exponent range starts from 1.

exponent is of 3bits, so exponent possible $2^3 = 8$ different values

non-negative lowest = 0.100×2^1

highest = 0.111×2^8

2. Derive the formula for machine epsilon (ϵ_M) for the Normalized form of floating point representation.

Same as lecture notes

3. For a system if $\beta = 2$, m=4 and e ϵ {-3,3} then how many non-negative number can be represented in a system following Denormalized form?

Denormalized form = $\pm 1.d_1d_2d_3d_4 \times 2^e$

∴ Total non-negative values = $2^4 \times 7 = 112$

4. If x=31/16, find fl(x) where m=4, e ϵ {-3,3} and the system follows Normalized Form of floating point representation. Also find the relative rounding error.

$x = \frac{31}{16} = \frac{16}{16} + \frac{8}{16} + \frac{4}{16} + \frac{2}{16} + \frac{1}{16} = 2^0 + 2^{-1} + 2^{-2} + 2^{-3} + 2^{-4}$

$= 1.1111 \times 0.11111 \times 2^1$

So this number can be represented using our system.

∴ $fl(x) = x = \frac{31}{16}$

∴ relative error = $\frac{\left|\frac{31}{16} - \frac{31}{16}\right|}{\left|\frac{31}{16}\right|} = 0.$