

**Problem 5. (12 points):**

Consider the following 5-bit floating point representation based on the IEEE floating point format. There is a sign bit in the most significant bit. The next three bits are the exponent, with an exponent bias is 3. The last bit is the fraction. The rules are like those in the IEEE standard (normalized, denormalized, representation of 0, infinity, and NAN).

As described in Handout #1, we consider the floating point format to encode numbers in a form:

$$V = (-1)^s \times M \times 2^E$$

where  $M$  is the *significand* and  $E$  is the *exponent*.

Fill in missing entries in the table below with the following instructions for each column:

**Description:** Some unique property of this number, such as, “The largest denormalized value.”

**Binary:** The 5 bit representation.

**$M$ :** The value of the Mantissa written in decimal format.

**$E$ :** The integer value of the exponent.

**Value:** The numeric value represented, written in decimal format.

You need not fill in entries marked “—”. For the arithmetic expressions, recall that the rule with IEEE format is to round to the number nearest the exact result. Use “round-to-even” rounding.

Description	Binary	$M$	$E$	Value
Minus Zero				$-0.0$
Positive Infinity		—	—	$+\infty$
	01101			
Smallest number $> 0$				
One				1.0
$4.0 - 0.75$				
$2.0 + 3.0$				