Example Floating Point Problem

Problem 1:

onsider the following 7-bit floating point representation based on the IEEE floating point format:

- There is a sign bit in the most significant bit.
- The next $k = 3$ bits are the exponent. The exponent bias is 3.
- The last $n = 3$ bits are the fractional part.

Numeric values are encoded in this format as a value of the form $V = (-1)^s \times M \times 2^E$, where s is the sign bit, E is exponent after biasing, and M is the significand.

Part I

Answer the following problems using either decimal (e.g., 1.375) or fractional (e.g., $11/8$) representations for numbers that are not integers.

A. For denormalized numbers:

   (a) What is the value E of the exponent after biasing? _____

   (b) What is the largest value M of the significand? _____

B. For normalized numbers:

   (a) What is the smallest value E of the exponent after biasing? _____

   (b) What is the largest value E of the exponent after biasing? _____

   (c) What is the largest value M of the significand? _____

Part II

Fill in the blank entries in the following table giving the encodings for some interesting numbers.

Description	E	M	V	Binary Encoding
Zero		0	0	`0 000 0000`
Smallest Positive (nonzero)				
Largest denormalized				
Smallest positive normalized				
One			1	
Largest finite number				
NaN	—	—	NaN	
Infinity	—	—	$+\infty$	

Recommended Book Practice Problems: 2.33, 2.34, 2.37
Solutions are at the end of the chapter.