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A. Show signed magnitude, 1's comple, 2's comple, excess 64. Use 7 bit

1) 35#

a) signed magnitude =

0 100011

b) 1's complement = same thing

0 100011

c) 2's complement =

0 100100

$$\frac{35}{2} = 17 \quad R=1$$

$$\frac{17}{2} = 8 \quad R=1$$

$$\frac{8}{2} = 4 \quad R=0$$

$$\frac{4}{2} = 2 \quad R=0$$

$$\frac{2}{2} = 1 \quad R=0$$

$$\frac{1}{2} = 0 \quad R=1$$

$$\begin{array}{r} 100011 \\ + 1 \\ \hline 100100 \end{array}$$

$$\begin{array}{r} 35 \\ + 64 \\ \hline 99 \end{array}$$

d) excess 64

$$35 + 64 = 99 \Rightarrow$$

1 110001<sub>2</sub>  
64 32 16 8 4 2 1

$$\frac{99}{2} = 49 \quad R=1$$

$$\frac{49}{2} = 24 \quad R=1$$

$$\frac{24}{2} = 12 \quad R=0$$

$$\frac{12}{2} = 6 \quad R=0$$

$$\frac{6}{2} = 3 \quad R=0$$

$$\frac{3}{2} = 1 \quad R=1$$

$$\frac{1}{2} = 0 \quad R=1$$

$$\begin{array}{r} 101001 \\ + 1 \\ \hline 101010 \end{array}$$

$$\frac{22}{2} = 11 \quad R=0$$

2) -22# a) signed magnitude =

1 010110

b) 1's complement = MSB same, flip

1 101001

c) 2's complement

$$1101001 + 1 = 1101010$$

d) excess 64

$$-22 + 64 = 42$$

0101010

$$\frac{42}{2} = 21 \quad R=0$$

$$\frac{21}{2} = 10 \quad R=1$$

$$\frac{10}{2} = 5 \quad R=0$$

$$\frac{5}{2} = 2 \quad R=1$$

$$\frac{2}{2} = 1 \quad R=0$$

$$\frac{1}{2} = 0 \quad R=1$$

$$\begin{array}{r} 64 \\ - 22 \\ \hline 42 \end{array}$$

42



B) show IEEE 754 bit patterns

1.)  $-0.035_{10} = -0.00001000111010110000100011$

$.035 \cdot 2 = .07_2$	$.12 \cdot 2 = .24_{10}$	$.84 \cdot 2 = 1.68_2$
$.07 \cdot 2 = .14_2$	$.24 \cdot 2 = .48_{10}$	$.68 \cdot 2 = 1.36_2$
$.14 \cdot 2 = .28_2$	$.48 \cdot 2 = .96_{10}$	$.36 \cdot 2 = .72_2$
$.28 \cdot 2 = .56_2$	$.96 \cdot 2 = 1.92_2$	$.72 \cdot 2 = 1.44_2$
$.56 \cdot 2 = 1.12_2$	$.92 \cdot 2 = 1.84_2$	$.44 \cdot 2 = .88_2$
$.88 \cdot 2 = 1.76_2$	$.16 \cdot 2 = .32_{10}$	$.12 \cdot 2 = .24_2$
$.76 \cdot 2 = 1.52_2$	$.32 \cdot 2 = .64_{10}$	$.24 \cdot 2 = .48_2$
$.52 \cdot 2 = 1.04_2$	$.64 \cdot 2 = 1.28_{10}$	$.48 \cdot 2 = .96_2$
$.04 \cdot 2 = .08_2$	$.28 \cdot 2 = .56_{10}$	$.96 \cdot 2 = 1.92_2$
$.08 \cdot 2 = .16_2$	$.56 \cdot 2 = 1.12_2$	$.92 \cdot 2 = 1.84_2$

2.)  $1010.01101_2$   
 $8421 \quad \frac{1}{2} \frac{1}{4} \frac{1}{8} \frac{1}{16} \frac{1}{32}$

$$\frac{1}{4} + \frac{1}{8} + \frac{1}{32} = \frac{13}{32}$$

$$2 + 8 = 10$$

$$10 \frac{13}{32}$$