Tutorial #7

CSE 321a: Computer Organization (I)
Third Year, Computer and Systems Engineering

Problem 10.6 (text book)
Compare zero-, one-, two-, and three-address machines by writing programs to compute: X = (A + B * C) / (D - E * F)
For each of the following four machines. The instructions available for use are as follows:

0 Address	1 Address	2 Address	3 Address
PUSH M	LOAD M	MOVE (X ← Y)	MOVE (X ← Y)
POP M	STORE M	ADD (X ← X + Y)	ADD (X ← Y + Z)
ADD	ADD M	SUB (X ← X − Y)	SUB (X ← Y − Z)
SUB	SUB M	MUL (X ← X × Y)	MUL (X ← Y × Z)
MUL	MUL M	DIV (X ← X/Y)	DIV (X ← Y/Z)
DIV	DIV M		

Zero-address	One-address	Two-address	Three-address

PUSH E
PUSH F
MUL
PUSH D
SUB
PUSH A
PUSH B
PUSH C
MUL
ADD
DIV
POP X
	LOAD E
	MUL F
	STORE X
	LOAD D
	SUB X
	STORE X
	LOAD B
	MUL C
	ADD A
	DIV X
	STORE X
		MOV X, E
		MUL X, F
		MOV AC, D
		SUB AC, AC
		MOV X, B
		MUL X, C
		ADD X, A
		DIV X, AC
			MUL AC, E, F
			SUB AC, D, AC
			MUL X, B, C
			ADD X, A, X
			DIV X, X, AC

External problem

If AC is 8 bits and contains -4 decimal number that is represented in sign and magnitude representation. Show the contents of AC register after perform the following shift operation:

1) Logical Right Shift
2) Logical Left Shift
3) Arithmetic Right Shift
4) Arithmetic Left Shift
5) Rotate Right
6) Rotate Left

1) Logical Right Shift

-4 = 10000100 in binary after perform LRS = 01000010 = + 66 in decimal

2) Logical Left Shift

-4 = 10000100 in binary after perform LLS = 00001000 = + 8 in decimal

3) Arithmetic Right Shift

-4 = 10000100 in binary after perform ARS = 11000010 = - 66 in decimal

4) Arithmetic Left Shift

-4 = 10000100 in binary after perform ALS = 10001000 = - 8 in decimal

5) Rotate Right

-4 = 10000100 in binary after perform LRS = 01000010 = + 66 in decimal

6) Rotate Left

-4 = 10000100 in binary after perform LRS = 00001001 = + 9 in decimal