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V19CS076

MIT Tutorial

(1.) Calculate the delay in following loop assuming the system clock period = 0.33 μs

	LXI B, 12FF H	10	B = 12
Delay:	DCX B	6	C = FF
	XTHL	16	
	XTHL	16	
	NOP	4	
	NOP	4	
	MOV A, C	4	
	ORA B	4	00 + 00 = 00
	JNZ DELAY	10/7	

Soln

$12FF\ H = 4863_{10}$

Now → $T = [10 + (6 + 16 + 16 + 4 + 4 + 4 + 4 + 10] \times 4863 - 3] \times 0.33\ \mu s$

$= [10 + 64 \times 4863 - 3] \times 0.33\ \mu s$

$= [7 + 311232) \times 0.33$

$= 102708.87\ \mu s$

$\approx 102\ ms$

(2) Specify the number of items the loop is executed.

a. MVI A, 17H
LOOP: ORA A

A = 23_{10}
00010111

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```
RAL
JNC LOOP
```

=> 4 time

b.
```
MVI A, 17H
LOOP: RAL
      ORA
      JNC LOOP
```

A = 0001

=> infinite time

C.
```
LXI B, 1000H
LOOP DCX B
     NOP
     JNZ LOOP
```

=> 1 time

(3) In the following load register with 00H and register B with C8H. Calculate the loop delay in loop1 & loop2. (C.P = 325 ns)

C = 00H , B = C8H

a)
```
MOV B, C8H          7T
LOOP2: MOV C, 00H   7T
       DCR C        4T
       INR LOOP1    10/7 T
       DCR B        4T
       JNZ LOOP2    10/7 T
```

$B = C8H = 200_{10}$

C.P = 325 ns

$DCR\ C = FFH = 255_{10}$

$T_{LP} = [119 \times 255] \times (-3) \times 325\ ns$

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$= 1159275$ ns ≈ 115 ms

$T_{L2} = 200 \times [1159275 + [7+4+10 \times 325 - 3 \times 325)$

$= 200 \times [1159275 + 6825 - 975]$

$= 200 \times 1165125$

$= 233025000$ ns

≈ 233 ms

b. C = FFH

DCR C = 254 70

$T_{L1} = [14 \times 254 - 3] \times 325$ ns

$= 1154725$ ns

$= 1.15$ ms

$T_{L2} = 200 [1154725 + 6825 - 975]$

$= 200 \times 1160575$

$= 232115000$ ns

≈ 232 ms

(4). Specify the number of times the following loop is executed.

a. MVI B, 64H — $B = 01100100_2 = 100_{10}$

LOOP: NOP

DCR B

JNZ LOOP

→ 100 times

b. ORA A — A = A

MVI B, 64H — $B = 64_H = 100_{10}$

LOOP: DCR B — JNZ → always

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JNZ LOOP

⇒ infinite loop

c. MVI A, 17H
LOOP: ORA A
RRC
JNC LOOP

A = 17H = 00010111₂

RRC → carry in 1st round

⇒ 1 time

(5). Calculate the count to obtain a 100μs delay. and express value in Hex

MVI B, count — 7
LOOP: NOP — 4
DCR B — 4
JNZ LOOP — 10/7

100 μs = 100000 μs

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Clock Frequency of PC = 1.60 GHz

$$T = \frac{1}{f} = \frac{1}{1.60} = 0.625 \text{ ns}$$

If C is count

$$100000 = (7 + 18C - 3C) \times 0.625$$

$$\frac{100000}{0.625} = 7 \times 0.625 + (18 - 3)C$$

$$160000 = 4.375 + 15C$$

$$C = \frac{160000 - 4.375}{15}$$

$$= 10666.375$$

$$\approx 10666_{10}$$

$$= 29AA_{H}$$