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MP3006 Date Nov 2008 No.

Q1

Address	Label	Instruction code	Mnemonics	Comments
0300	START	LDAA $FC05	B6 FC 05	take reading from sensor
0303		CMPA #100	81 64	compare reading w/ the benchmark
0305		BLO START	25 F9	check reading again if not reached
0307	OPEN	LDAB $DD05	F6 DD 05	take current reading of valve switch
030A		EORB #$EF	C8 EF	toggle the reading
030C		STAB $DD05	F7 DD 05	return to the switch to open the valve
030F		WAI	3E	halt program

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Q2a) '74' corresponds to 'BHS', which is taking reference addressing mode.

$94_{unsigned} = -6C_{signed}$

∴ the address being referred is $66D7_{16} - 006C_{16} = 666B_{16}$ #

b) 1000, 0111. 0001. 0011

↓ ↓ ↓ ↓

8 7 1 3

∴ 8713 is the hexadecimal equivalent of the BCD number

c) i) $84_{16} = 10000100_2$

assume carry was originally 0.

∴ (carry = 1, operand = 0000, 1000 after ROL #

ii) 1000, 0100 && 0111, 1011 ⇒ 0000, 0000 #

Z = 0 #

iii) 0001, 0001 + 1000, 0100 = 1001, 0101 (ACCA) #

0001, 0001 (ACCB) #

0001, 0001

1000, 0100

1001, 0101

∵ carry in = carry out = 0

∴ V = 0 #

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d) ACCD can be used as one 4 byte register or two 2 bytes register A & B.
I.X can only be used as one register

e) i) [ACCA + 1] → [ACCA] : INCA
ii) [ACCB - 1] → [ACCB] : DECB
iii) [SP - 1] → [SP] : DES

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Q2a) Since it's taking input from the sensor

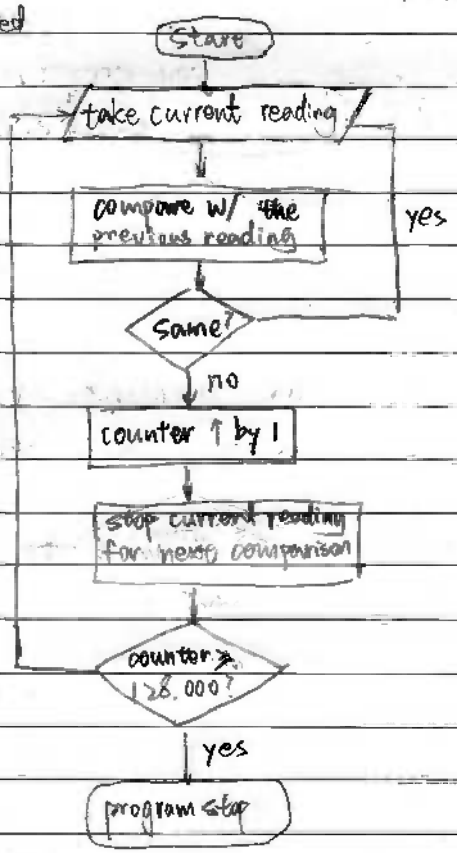
∴ we need to configure port A as a input port for all 8 pins

∴ we just need to output 00_{16} to ddra.

b) ∵ 8 bits are to represent to 360° ∴ resolution = $\frac{360°}{2^8-1} = 1.4118°$

c) ∵ any change in reading corresponds to a turn of 1.4118°

∴ we can write a program which counts for the number of changes in reading. once the number reaches $\frac{500 \times 360°}{1.4118°} = 127,500_{10}$ the program will be interrupted



d) once it's changed to BCD, the range for 8-bit should be 0–99

∴ resolution = $\frac{360°}{99} \approx 3.6364°$

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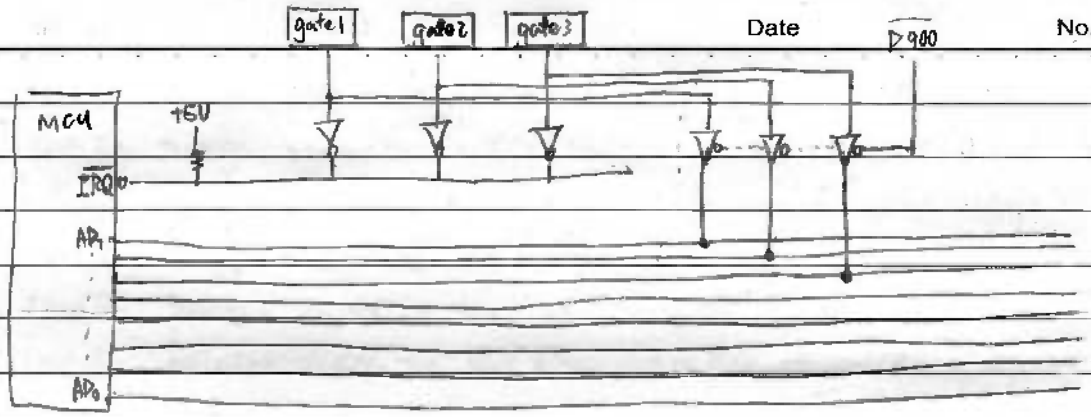
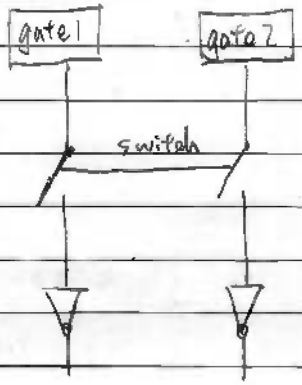
(a)



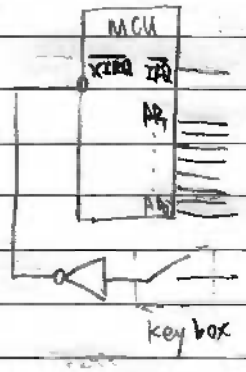
whenever a gate is opened, system is interrupted. In the ISR, system will poll the status of 3 gates one by one, until the open gate is identified.

b)



we can add a switch in the gate 1 & 2's circuit. In the day time, the switch is open and gate 1 & 2 are not armed. In the night, the switch is closed to arm the two gates.

c)



we can connect the key box as a switch to the XIRQ, once a key is turned, the original ISR will be interrupted and system will jump into XIRQ's ISR, which instruct the alarm to be deactivated.

d). when system is interrupted, the ISR pushes the system information into the stack in the order of PC_L, PC_H, IY_L, IY_H, IX_L, IX_H, ACCA, ACCB, CCR. The stack pointer will point to the address before CCR. When system returns from ISR, stack pointer will start incrementing while the values inside the stack will be restored to their respective register in a Last-in-First-out manner.

quality assured