

Nom i Cognoms: _____

1) Què tenim de mal fet en aquest codi de les rutines d'interruptió de les entrades externes 0 i 1 que compten els respectius polsos arribats?

```
ORG 0x08
ISR_hi      btfss    INTCON,INT0IF      ; check interrupt source
            retfie fast                  ; not caused by INT0, return
            incf     count0,F
            bcf INTCON, INT0IF          ;clear interrupt bit
            retfie fast

ORG 0x18
ISR_lo      btfss    INTCON3,INT1IF     ; check interrupt source
            retfie fast                  ; not caused by INT1, return
            incf     count1,F
            movff    count,PORTD        ; output count to LEDs
            bcf INTCON3, INT1IF         ;clear interrupt bit
            retfie fast
```

2) Quan permetem dos nivells d'interruptió (RCON.IPEN=1) podem habilitar les de nivell baix sense habilitar les de nivell alt?

3) A banda de l'adreça de retorn, quins són els tres registres que representen el context d'un programa que cal salvar quan entra una rutina d'interruptió?

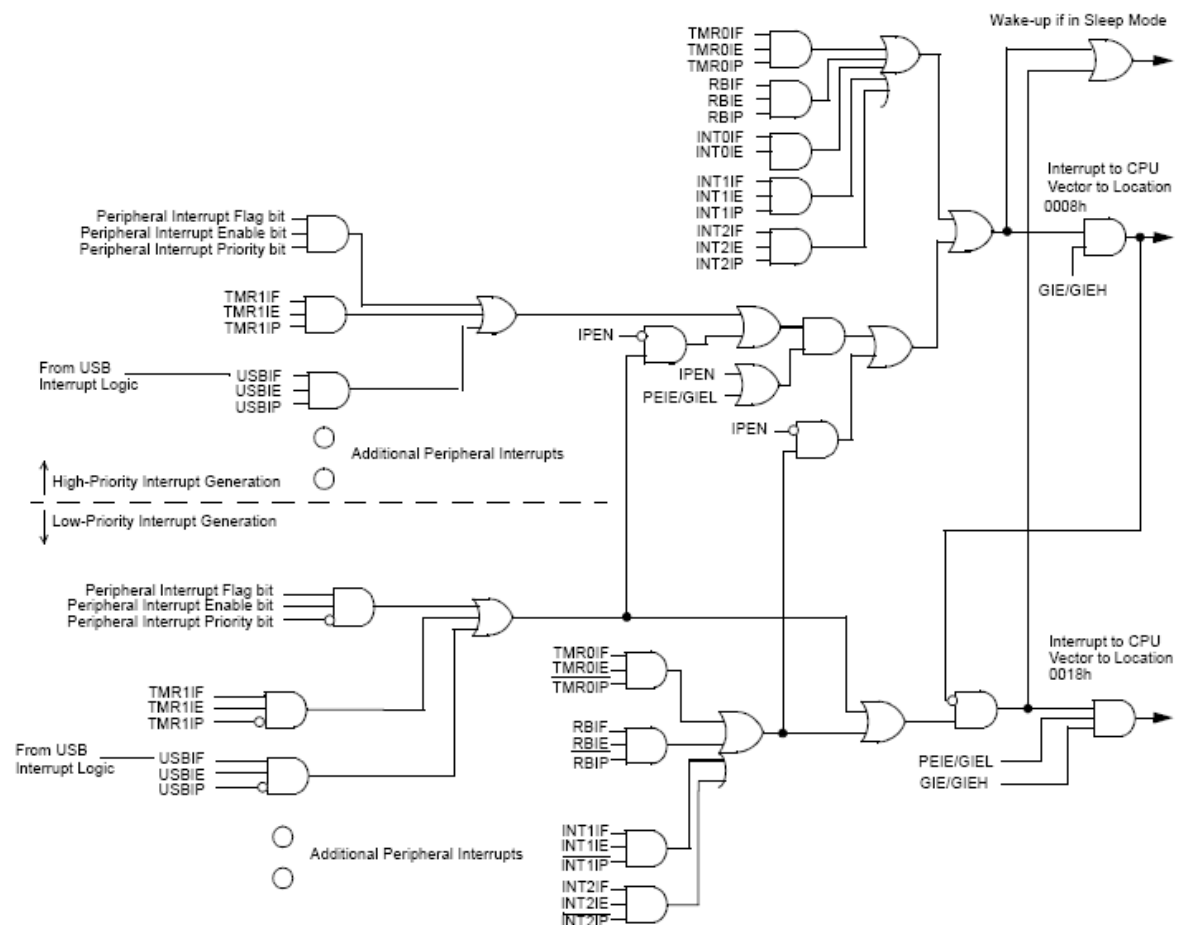
4) Si decidim preparar així l'arribada d'interrupcions externes INT0, on hi hem connectat un botó que ja hem comprovat que funcioni bé:

```

...
bsf      RCON,IPEN           ;Habilitem prioritats
bsf      INTCON,GIEH         ;Habilitem les d'alta prioritat
bsf      INTCON,INT0IE       ;Habilitem la màscara de la interrupció INT0
...

```

Pot ser que ens salti la rutina d'interrupció instantàniament sense que ens dongui temps a tornar apretar el botó? Perquè?



Nom i Cognoms: _____

5) Si posem 4 displays de 7 segments a bits lliures dels ports A, B, C i D del nostre micro, podem donar 10mA de corrent a tots els LEDS quan representem el número 8888? Perquè?

| Absolute Maximum Ratings ^(†) | |
|---|-----------------------------------|
| Ambient temperature under bias..... | -40°C to +85°C |
| Storage temperature | -65°C to +150°C |
| Voltage on any pin with respect to V _{SS} (except V _{DD} and MCLR) (Note 3) | -0.3V to (V _{DD} + 0.3V) |
| Voltage on V _{DD} with respect to V _{SS} | -0.3V to +7.5V |
| Voltage on MCLR with respect to V _{SS} (Note 2) | 0V to +13.25V |
| Total power dissipation (Note 1) | 1.0W |
| Maximum current out of V _{SS} pin | 300 mA |
| Maximum current into V _{DD} pin | 250 mA |
| Input clamp current, I _{IK} (V _I < 0 or V _I > V _{DD}) | ±20 mA |
| Output clamp current, I _{OK} (V _O < 0 or V _O > V _{DD}) | ±20 mA |
| Maximum output current sunk by any I/O pin | 25 mA |
| Maximum output current sourced by any I/O pin | 25 mA |
| Maximum current sunk by all ports | 200 mA |
| Maximum current sourced by all ports | 200 mA |

6) Si a un bit del port A li entrem un senyal sinuïdal centrat a 1.8V, amb amplitud de 1V i freqüència de 100Hz, quina probabilitat hi ha de llegir un '1' en un moment triat a l'atzar? I la de llegir un '0'? (suposeu VDD=4V) Justifica gràficament la resposta.

| DC CHARACTERISTICS | | | Standard Operating Conditions (unless otherwise stated) Operating temperature -40°C ≤ T _A ≤ +85°C for industrial | | | |
|--|-----------------|--|---|--|---------------------------------|--|
| Param No. | Symbol | Characteristic | Min | Max | Units | Conditions |
| D030 D030A D031 D032 D032A D033 | V _{IL} | Input Low Voltage I/O Ports (except RC4/RC5 in USB mode): with TTL Buffer with Schmitt Trigger Buffer RB0 and RB1 MCLR OSC1 and T1OSI OSC1 | V _{SS} — V _{SS} V _{SS} V _{SS} V _{SS} | 0.15 V _{DD} 0.8 0.2 V _{DD} 0.3 V _{DD} 0.2 V _{DD} 0.3 V _{DD} 0.2 V _{DD} | V V V V V V V | V _{DD} < 4.5V 4.5V ≤ V _{DD} ≤ 5.5V When in I ² C™ mode XT, HS, HSPLL modes ^(†) EC mode ^(†) |
| D040 D040A D041 D042 D042A D043 | V _{IH} | Input High Voltage I/O Ports (except RC4/RC5 in USB mode): with TTL Buffer with Schmitt Trigger Buffer RB0 and RB1 MCLR OSC1 and T1OSI OSC1 | 0.25 V _{DD} + 0.8V 2.0 0.8 V _{DD} 0.7 V _{DD} 0.8 V _{DD} 0.7 V _{DD} 0.8 V _{DD} | V _{DD} V _{DD} V _{DD} V _{DD} V _{DD} V _{DD} V _{DD} | V V V V V V V | V _{DD} < 4.5V 4.5V ≤ V _{DD} ≤ 5.5V When in I ² C mode XT, HS, HSPLL modes ^(†) EC mode ^(†) |

7) Tindrà el mateix efecte executar aquests dos codis?

```
TRISA = 0xFE;
PORTA=0xFF;
```

```
LATA=0x01;
TRISA=0x00;
```

8) En la pantalla LCD emprada a la pràctica, i amb les connexions realitzades, com podem escriure el contingut de la memòria de generació de caràcters, CGRAM? i com podem llegir-la?

Table 7.6 HD44780 instruction set

| Instruction | Code | | | | | | | | | | Description | Execution time |
|------------------------------------|------|-------------------|------------|---------------------|---------------|----|-----|-----|-----|----|--|----------------|
| | RS | R/ \overline{W} | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 | | |
| Clear display | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | Clears display and returns cursor to the home position (address 0). | 1.64 ms |
| Cursor home | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | * | Returns cursor to home position (address 0). Also returns display being shifted to the original position. DDRAM contents remain unchanged. | 1.64 ms |
| Entry mode set | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | I/D | S | Set cursor move direction (I/D), specifies to shift the display (S). These operations are performed during data read/write. | 40 μ s |
| Display on/off control | 0 | 0 | 0 | 0 | 0 | 0 | 1 | D | C | B | Sets on/off of all display (D), cursor on/off (C) and blink of cursor position character (B). | 40 μ s |
| Cursor /display shift | 0 | 0 | 0 | 0 | 0 | 1 | S/C | R/L | * | * | Sets cursor-move or display-(S/C), shift direction (R/L). DDRAM contents remains unchanged. | 40 μ s |
| Function set | 0 | 0 | 0 | 0 | 1 | DL | N | F | * | * | Sets interface data length (DL), number of display line (N) and character font (F). | 40 μ s |
| Set CGRAM address | 0 | 0 | 0 | 1 | CGRAM address | | | | | | Sets the CGRAM address. CGRAM data is sent and received after this setting. | 40 μ s |
| Set DDRAM address | 0 | 0 | 1 | DDRAM address | | | | | | | Sets the DDRAM address. DDRAM data is sent and received after this setting. | 40 μ s |
| Read busy flag and address counter | 0 | 1 | BF | CGRAM/DDRAM address | | | | | | | Reads busy flag (BF) indicating internal operation is being performed and reads CGRAM or DDRAM address counter contents (depending on previous instruction). | 0 μ s |
| Write to CGRAM or DDRAM | 1 | 0 | write data | | | | | | | | Writes data to CGRAM or DDRAM. | 40 μ s |
| Read from CGRAM or DDRAM | 1 | 1 | read data | | | | | | | | Reads data from CGRAM or DDRAM. | 40 μ s |