

Complete, fold and seal
(see note 2 below)

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12 Pages

1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right, fold over and seal down (using the label provided) to hide your name.
3. The answers must be legibly written. The Examiners can either ignore illegible script or have it typed and the expense of typing charged to the candidate.
4. Write your answers in ink.
5. Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.
6. No part of this book is to be torn out; it must be handed in complete.
7. If more books than one are used, fasten them together using the tags available from the invigilator(s).
8. **Every book must be handed in. In no circumstances may answer books, used or unused, be taken out of the examination venue.**

1	Student Number	ALT19842514
2	Title of Examination Paper	Micros periphera and interfaces
3	Module Code	TBA
4	Date and Time of Examination	08/05/19
5	Examination Venue	
6	Seat Number	
7	Number of Answer Books handed in	

[illegible]

80%

First Question

(1)

(a) hex $\rightarrow$ Binary

$$(58)_{\text{hex}} = 0101\ 1000$$

$$(3A)_{\text{hex}} = 0011\ 1010$$

$$\text{ADDWF} = \underline{1001\ 0010} \quad \checkmark \quad \leftarrow \text{Location 0E}$$

$$Z = 0 \quad \checkmark$$

$$C = 0 \quad \checkmark$$

$$DC = 1 \quad \checkmark$$

3 ✓

(b) hex $\rightarrow$ Binary

$$(5A)_{\text{hex}} = 0101\ 1010$$

RLF $\left[\boxed{0} \leftarrow \boxed{0101\ 1010} \right] \quad \checkmark$

$$* \text{RLF} = \underline{1011\ 0100} \quad \underline{DC = 0}$$

$$* \text{INCF} = \underline{1011\ 0101} + 1 \quad \underline{DC = 0}$$

* RLF $\left[\boxed{0} \leftarrow \boxed{1011\ 0101} \right]$
 $\boxed{1} \quad 0110\ 1010 \quad \underline{DC = 1}$

3 ✓

$$\text{Location 14} = \underline{1011\ 0101}$$

$$* \text{INCF} = \underline{1011\ 0101} + 1 \quad \checkmark$$

(C) To run the delay 5 times, the number 5 should be saved in a memory location, then decrement it by 1.

Count1 equ ~~0x12~~ 0x05

MOVLW 0x05 ✓

MOVWF Count1

CALL Delay1

DECF Count1

GoTo Loop

NOP

NOP

Second Question

(a) As the stack is a memory where the instructions of the programme are stored, so if the stack is smaller say only 8 locations, this limits the number of instructions could be stored to 8 instructions, producing very short programme.

(b) Subroutines :

are codes or programmes that run inside the main programme, and could be called to get executed whenever required. normally it is used to do the same code "repeated action" many times in the programme by just writing CALL subr and the name of the subroutine with no need to write the whole code everytime that repeated action is required. which results in shorter programme and reduces the amount of space of memory occupied by the programme.

Interruptions :

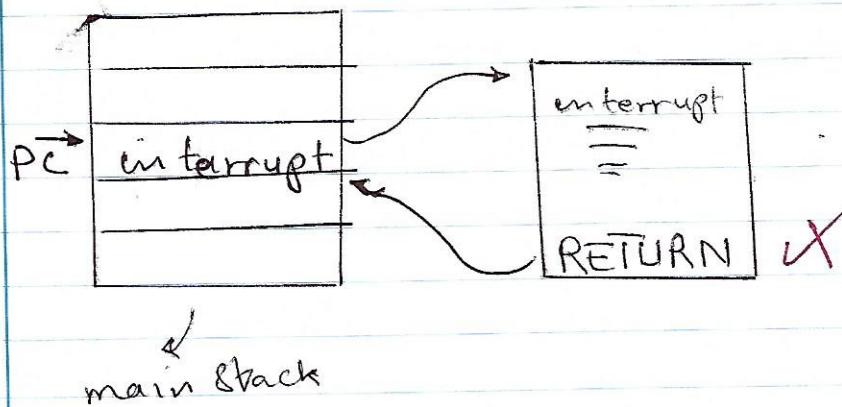
The interrupt is a code runs whenever unexpected or unplanned action happens and affect the programme or the hardware.

interrupts could be hardware such as whenever the user presses a switch then the programme stops the flow of the code by doing different thing then goes back. also the interrupt could be software as part of the code as a timer.

5

(C)

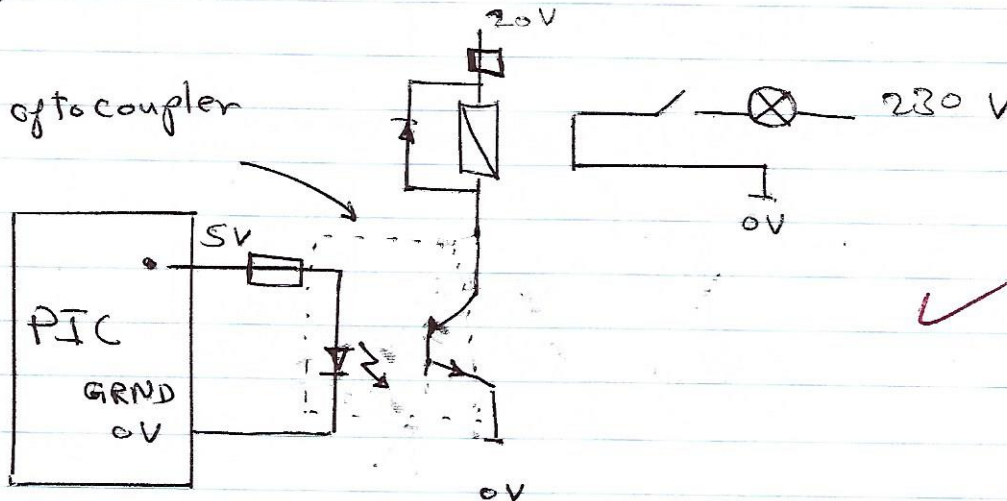
In order to ensure a programme resumes operation in a correct state, at the end of the instructions of the interrupt, the Command **RETURN** should be included, which gives the programme Counter of the interrupt to go back to the main programme counter in the stack



Third Question

(a) The output of a 16F84A PIC is 5 volts DC so it is not possible to connect any ac Load to it directly. ✓

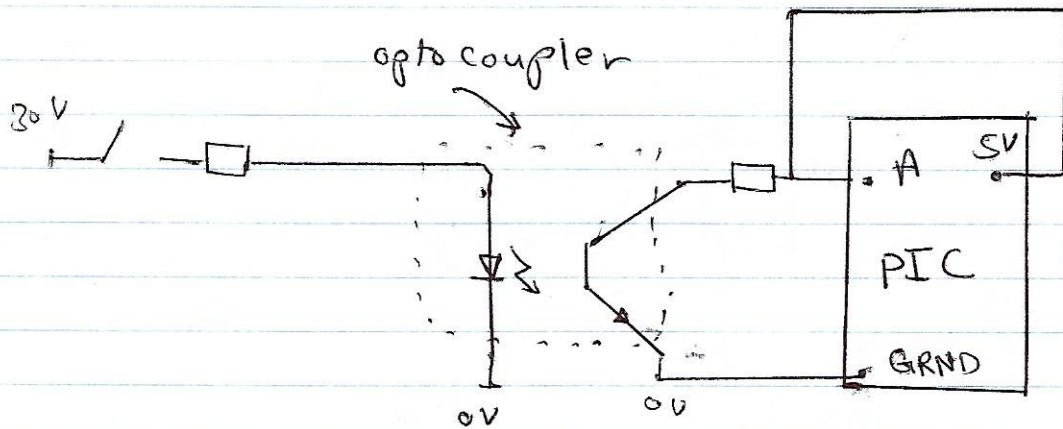
(b)



to control the ON/OFF state of 230 ac volt lamp we need to use optocoupler which provides more protection to the microcontroller. also use relay to control the 230 ac voltage supply to the lamp. ✓

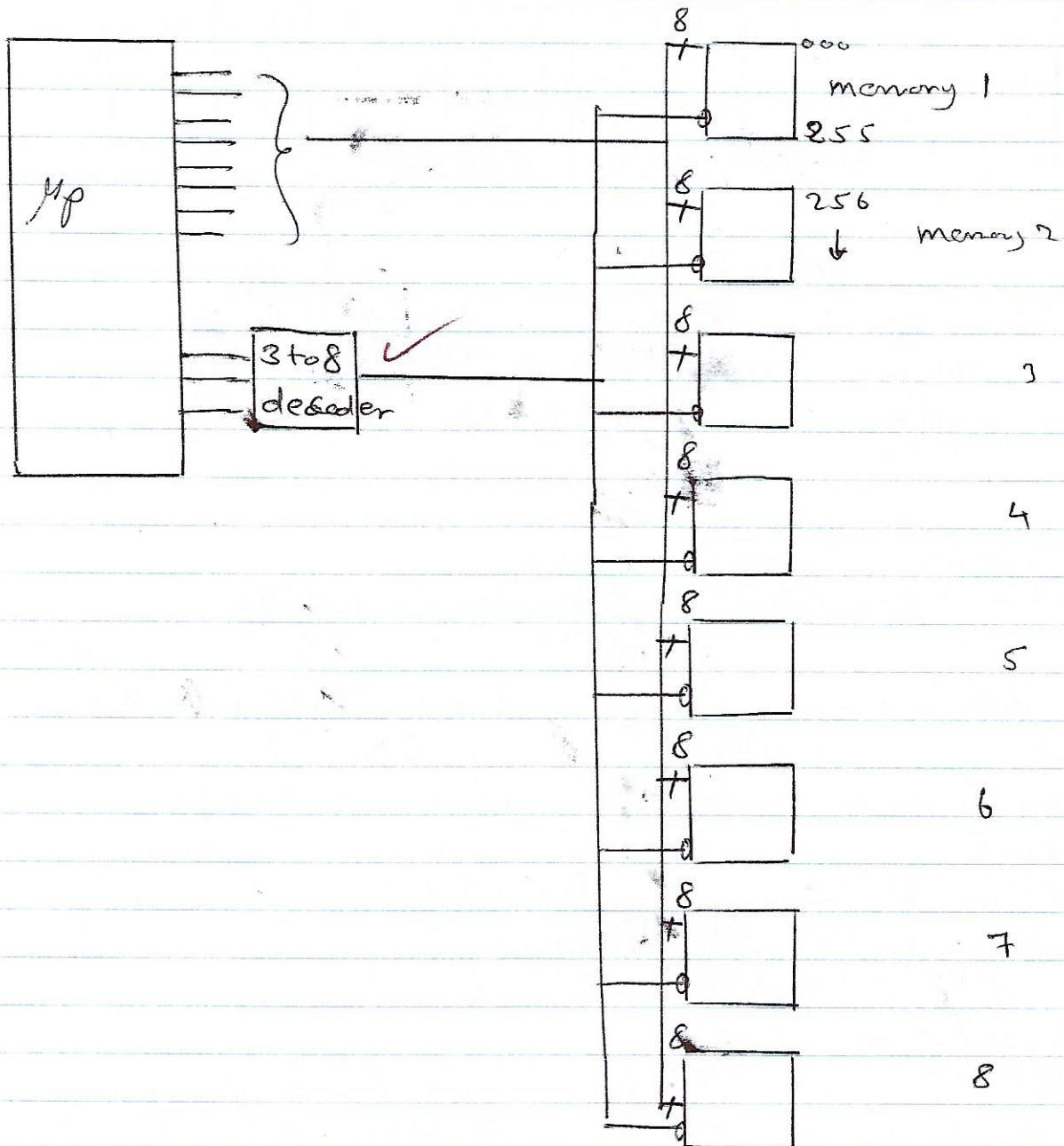
(c) In order to avoid false input from switch reading we need to debounce the switch to avoid the mechanical vibration once the switch is opened or closed. ✓

(d) to ensure the switch is electrically isolated, we need to use opto coupler. when the switch is closed the microcontroller reads zero volt but when the switch is open the micro controller reads 5V as shown below.



Fourth Question

(a) as the microprocessor has 11 bit external bus and 8 bit memory devices, so we could connect 8 memory devices and choose from them to save the data using a 3 to 8 decoder as shown.



the decode is active Low and it produces the following truth table

C	B	A	8	7	6	5	4	3	2	1
0	0	0	1	1	1	1	1	1	1	0
0	0	1	1	1	1	1	1	1	0	1
d	1	0	1	1	1	1	1	0	1	1
d	1	1	1	1	1	1	0	1	1	1
1	0	0	1	1	1	0	1	1	1	1
1	0	1	1	1	0	1	1	1	1	1
1	1	0	1	0	1	1	1	1	1	1
1	1	1	0	1	1	1	1	1	1	1

decimal $\rightarrow$ hex
 (b) $(875)_{10} \rightarrow 36B_{16}$ hex

hex $\rightarrow$ Binary
 001101101011

So the number is 01101101011 ✓

as IC starts with 011 so we check the truth table above we find the decoder is Low at memory number "4" which is where 875 will be stored. ✓

Fifth Question

(a) in SPI

Speed

- provides high speed
- works only for short distance
- Requires four wires
- Supports only one master

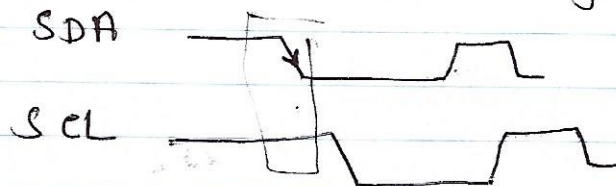
3.
✓

RS 232

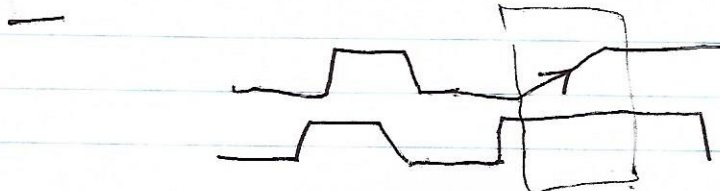
- Speed is 20 kbs which is very slow
- works only for less than 50 feet
- Requires nine pins

(b)

(i) the master indicates the message is due by pulling the serial data line (SDA) Low while the serial clock line is high (SCL)

1.
✓

(ii) the master indicates the message is ended by pulling the serial data line (SDA) HIGH while the serial clock line (SCL) is HIGH

1.
✓

(iii) the slave indicates to the master it is not ready to receive data by sending not acknowledge (Nack) which is "1"

