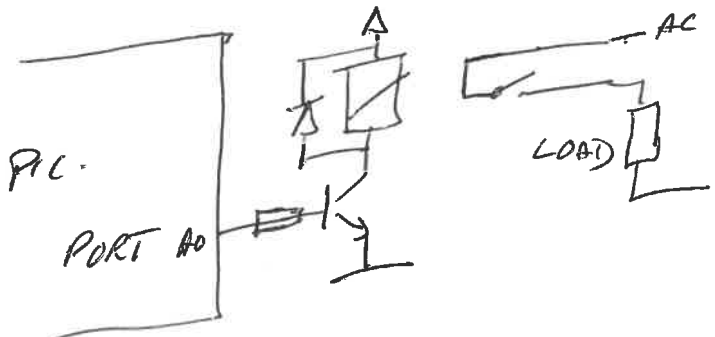
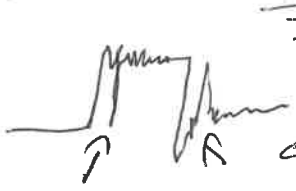
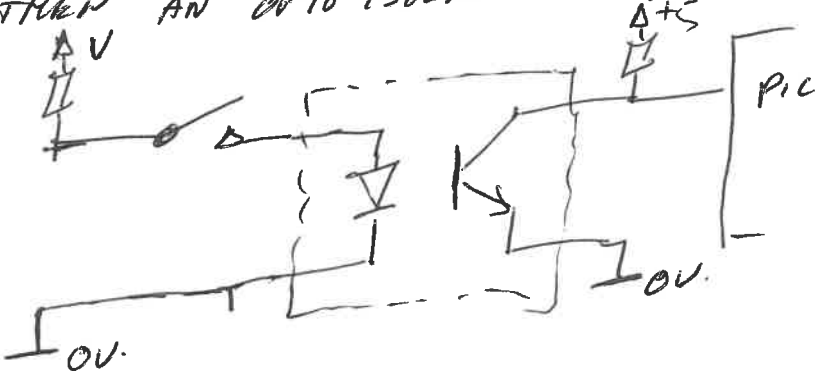


Question	marks																																								
Q1a <table><thead><tr><th></th><th></th><th>OE</th><th>Z</th><th>C</th><th>DC</th></tr></thead><tbody><tr><td>MOVLW</td><td>0x58</td><td>x</td><td>x</td><td>x</td><td>x</td></tr><tr><td>MOVWF</td><td>Post1</td><td>0x58</td><td>x</td><td>x</td><td>x</td></tr><tr><td>MOVLW</td><td>0x3A</td><td>0x58</td><td>x</td><td>x</td><td>x</td></tr><tr><td>ADDWF</td><td>Post1</td><td>0x92</td><td>0</td><td>0</td><td>1</td></tr></tbody></table> <table><tbody><tr><td>58</td><td>01011000</td></tr><tr><td>3A</td><td>00111010</td></tr><tr><td></td><td> </td></tr><tr><td></td><td>10010010</td></tr><tr><td></td><td>DC</td></tr></tbody></table>			OE	Z	C	DC	MOVLW	0x58	x	x	x	x	MOVWF	Post1	0x58	x	x	x	MOVLW	0x3A	0x58	x	x	x	ADDWF	Post1	0x92	0	0	1	58	01011000	3A	00111010				10010010		DC	1 1 1
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Q1b. <table><thead><tr><th></th><th></th><th>0x14</th><th></th></tr></thead><tbody><tr><td>MOVLW</td><td>0x5A</td><td>c</td><td>01011010</td></tr><tr><td>MOVWF</td><td>Data1</td><td></td><td>10110100</td></tr><tr><td>RLF</td><td>Data1</td><td></td><td>10110101</td></tr><tr><td>INCF</td><td>Data1</td><td></td><td>01101010</td></tr><tr><td>RLF</td><td>Data1</td><td>1</td><td>01101011</td></tr><tr><td>INCF</td><td>Data1</td><td>1</td><td>01101011</td></tr></tbody></table> c = 1			0x14		MOVLW	0x5A	c	01011010	MOVWF	Data1		10110100	RLF	Data1		10110101	INCF	Data1		01101010	RLF	Data1	1	01101011	INCF	Data1	1	01101011	1 1 1												
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Q1c. <pre>Count1 equ 0x12. ; ; MOVLW 0x05* MOVWF COUNT1 * LOOP CALL DELAY1 DECFSZ COUNT1* GOTO LOOP NOP NOP</pre>	1 1 2																																								

Question		marks
Q2 a)	WITH 8 LOCATIONS IT IS POSSIBLE TO STORE UP TO 8 P.C RETURN ADDRESS'S SO SUBROUTINES COULD BE NESTED - 8 DEEP. IF INTERRUPTS ARE ENABLED THEN THIS NUMBER WOULD NEED TO BE DECREASED ACCORDINGLY.	3
b)	TYPICAL ANSWER. SUB ROUTINES ARE CALLED IN ORDER TO MAKE CODING MORE EFFICIENT. CODE MAY BE USED MANY TIMES OVER BEING CALLED AT VARIOUS POINTS IN THE PROGRAM. THEY ALLOW FOR SEGMENTING AND TESTING OF VARIOUS ALGORITHMS. - THEY INTRODUCE GREATER STRUCTURE IN THE PROGRAM. INTERRUPTS ARE USED FOR TIME CRITICAL EVENTS THAT MAY OCCUR DUE TO EXTERNAL OR INTERNAL (Eg TIMER) ACTIVITY. THEY CAUSE THE PROGRAM TO DIVERT TO AN INTERRUPT ROUTINE ASYNCHRONOUS TO THE MAIN PROGRAM.	5
c)	IF AN INTERRUPT OCCURS IT IS NECESSARY TO STORE ALL WORKING AND STATUS REGISTERS SO THAT THEY MAY BE RESTORED FOLLOWING COMPLETION OF THE INTERRUPT ROUTINE.	2

Question		marks
Q3	a) A PIC 16F84A ONLY MAX D.C OUTPUTS	1
b)	TYPICAL. 	3
c)	A SWITCH INPUT MAY 'BOUNCE' DUE TO THE MECHANICAL NATURE OF THE SWITCH. A DEBOUNCE ROUTINE IS USED TO READ - STORE - RE-READ THE INPUT. 	3
d)	TYPICAL ANSWER. FOR A SWITCH THAT IS OFTEN OPERATED THEN AN OPTO ISOLATOR MAY BE USED  FOR FREEDOM OTHER SOLUTIONS COULD INCLUDE RELAYS.	3

Question

marks

Q4

Using a 3 to 8 Decoder so that 8 memory devices can be addressed as part of the memory map. Each device has 256 memory addresses. This way all 2048 memory locations may be covered.

Q4b

Memory address 875

$=$ $\begin{matrix} \text{MSB} \\ 0 & 1 & 1 & | & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 \end{matrix}$

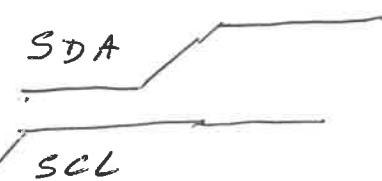
$\swarrow$

Decoder

$= 3 \Rightarrow \text{CHIP 4}$

So ADDRESS 107 IN CHIP 4

$= \text{ADDRESS } 768 + 107 = 875$

Question		marks
Q5a	TYPICAL ANSWERS WILL DESCRIBE SPEED, SYNCHRONISATION, DISTANCE, POINT $\rightarrow$ POINT / INTERNAL - EXTERNAL. ETC 1 MARK FOR EACH VALID	4.
b)	i) A START CONDITION IS INDICATED BY TAKING ^{HIGH TO} SDA LOW DURING A SCL HIGH PERIOD  SDA SCL.	1
ii	A STOP CONDITION IS INDICATED BY A LOW TO HIGH TRANSITION DURING A SCL HIGH PERIOD  SDA SCL	1
iii	A SLAVE INDICATES IT IS NOT READY TO RECEIVE DATA BY ISSUING A NACK DURING 9th CLOCK. FOLLOWING A BYTE. MASTER RELEASES SDA, FOR A NACK SLAVE DOES NOT PULL SDA LOW.	2.
iv.	5001100110111010110P.	2