

Question 1

a) ALU - arithmetic logic unit, used to perform arithmetic and logic operations

Program counter - special register that is used to hold the address of the next instruction to be executed by the processor

TRISA (TRISB) - These are data direction registers. These determine whether a digital I/O pins is designated as an input or output.

b). the command may contain extra subroutines / directives that need to be accessed.

Question 1 cont.

c.) An RISC is a reduced instruction set computer

Advantages:

- allows high level language compilers to produce more efficient code.
- Simplified instruction set.
- Cheap to produce.

Disadvantages.

- requires very fast memory system
- performance varies depending on code executed.

d.) I would use assembly language as they are faster and would use less memory than the same features written in a high level language.

Question 2.

a). The main purpose of a stack is to store and retrieve return addresses during function calls.

ex.

When used for push operation it can insert data at a specified address to the top of the stack.

b). a subroutine is a piece of code that may be called and executed anywhere in a program. It is typically a set of instructions that you may use multiple times.

- Therefore you reduce the amount of duplicate code in a program.
- Allows re use of particular code across multiple programs.
- If you want to change something you only have to change it in the sub routine.

Question 2 cont.

c). an external interrupt is triggered by a user. Once the external interrupt is triggered, the PIC stops the current program and executes a special piece of code, whilst storing the next instruction in stack memory.

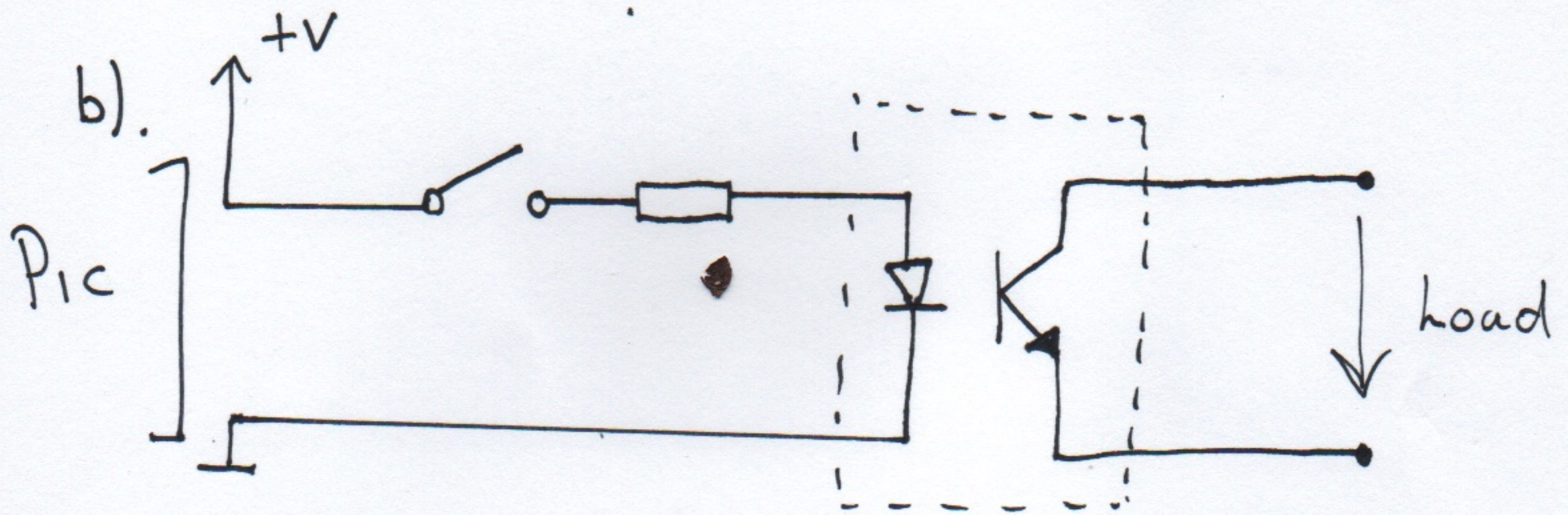
Using the interrupt vector table it then jumps to the correct ISR. From here it executes the instructions in the ISR.

Once this is done, the program counter and status needs to be restored to what it was before interrupt using the stack.

Finally the program will execute the initial instruction sequence.

Question 3

- a) without interfacing you can only connect a DC load to the out put pins of a PIC16F84.



- c). one issue that often arises is contact bouncing. This means we can sometimes get false readings.

Safe reliable interfacing can be achieved by using Relays, diodes etc.

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Question 3 cont.

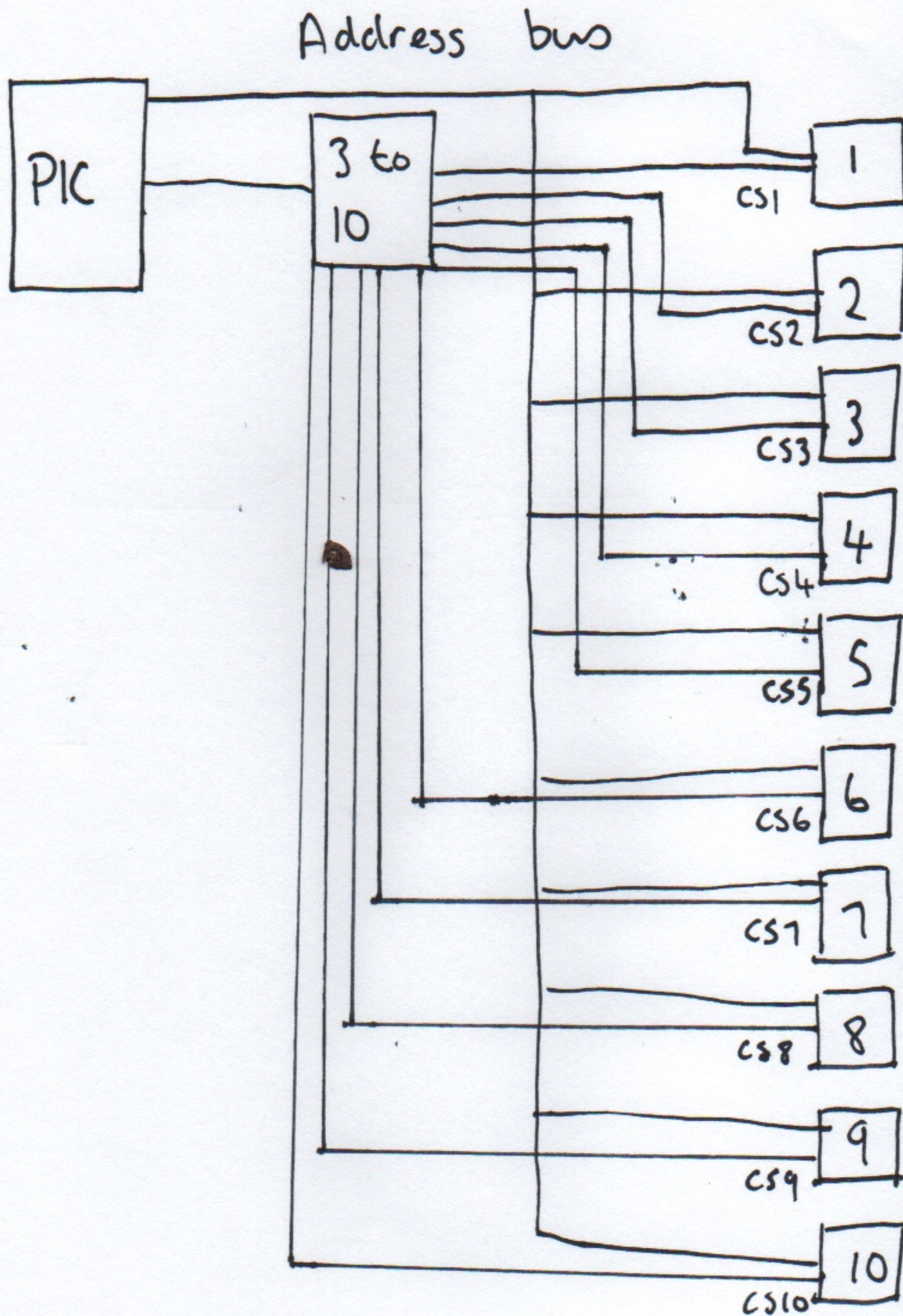
d).

2048	1024	512	256	128	64	32	16	8	4	2	1
1	0	1	0	0	1	1	0	0	1	1	1

Answer = 101001100111
(2663).

Question 4

a).



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Question 4 a cont.

A13	A12	A11.	CS11	CS10	CS9	CS8	CS7	CS6	CS5	CS4	CS3	CS2	CS1
0	0	0											0
0	0	1										0	
0	1	0									0		
0	1	1								0			
1	0	0							0				
1	0	1						0					
1	1	0					0						
1	1	1				0							

b). 46a9 = 1001001011011.

CS 603

Chip select 5, location 603.

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Question 4 cont.

c). In Harvard the CPU is connected with both the data memory (RAM) and program memory (ROM) separately

In Von neuman there is no separate data and program memory.

Question 5.

a) DMA allows certain hardware subsystems to access main system memory (RAM) independent of the CPU.

The three modes of operation are:

Burst mode: the entire block of data is transferred in one sequence. It is the fastest mode of transfer.

Cycle steal: In this mode only one byte is transferred at a time.

This is slower than burst mode.

Transparent: This mode only transfers data when the CPU is not using the system buses. It is the slowest of the ~~three~~ three modes.

Question 5 cont.

b.) Synchronous interface is used to transmit data when you may not have an internal clock, Asynchronous would use an internal clock.

Synchronous - I^2C

Asynchronous - RS-232.

c.) I^2C can be multi master and multi slave whereas SPI does not have multi master protocol.

I^2C is half duplex and SPI is full duplex

SPI is faster than I^2C

I^2C is better for long distance, SPI better over short distance.

d.) SCL high with a high to low transition on SDA line

END