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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	230 6478
2	Title of Examination Paper	Micros Peripherals and Interfaces
3	Module Code	ACDA 4004
4	Date and Time of Examination	08/01/2023 0900
5	Examination Venue	3A310
6	Seat Number	035
7	Number of Answer Books handed in	

List the numbers of the questions you have attempted	Office Use
1	10
2	8
3	3
4	~~10~~ 0
5	7 $\frac{1}{2}$
6	5
	33 $\frac{1}{2}$
Total	67 $\frac{1}{2}$

$$\begin{array}{r} 10 \\ 8 \\ 3 \\ 0 \\ 7\frac{1}{2} \\ \hline 5 \\ \hline 33\frac{1}{2} \end{array}$$

①

a) RETURN is short for return from function / Subroutine
 its function is to pull the return address from the stack (which is set when ~~the~~ running the CALL instruction) and then load that value into the program counter, effectively returning execution back to just after the CALL instruction.

2

2.

b) SLEEP is a mnemonic which puts the processor into a low power operation mode, ~~where~~ in which the processor does not execute instructions, it can then be woken from this sleep state by an interrupt and resume normal operation.

2

2.

c) ADDLW - Add Literal Working Register
 This instruction will add ~~the~~ the literal value specified onto the value in the working register and store the result also in the working register.

2

2.

d) BCF a,b - Bit Clear File, file, bit
 This instruction clears (sets to zero) a bit within ~~the~~ a file register. The exact file register is specified by the f parameter and the bit by the b ~~parameter~~ parameter.

2

2.

e) DECF - Decrement File

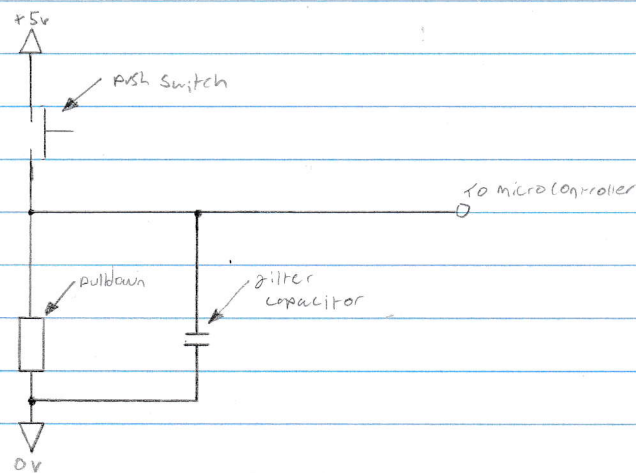
This instruction subtracts one from the file register pointed to by its parameter.

2

2.

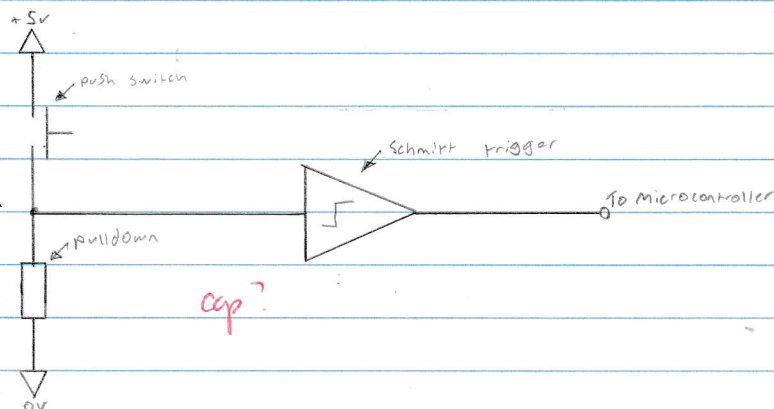
10.

② Solution 1:



This circuit works by having the push switch charge the capacitor up rapidly when pushed as it is effectively a dead short to +5V then if the switch exhibits bouncing behaviour, the capacitor will hold the voltage high for a time, as it will ~~not~~ be slowly discharging through the ~~the~~ pull-down resistor. In this way the filter capacitor can act as a low pass filter on the trailing edge of any pulses from the push button.

Solution 2:



This circuit employs a Schmitt trigger which is an IC that latches based on a high and a low threshold voltage. This means that ~~with the~~ ~~the~~ with a sufficiently high value pull-down the inductive capacitance on the circuit wiring and the switch will act to keep the voltage ripple caused by the switch bounce in between the thresholds of the Schmitt trigger, causing it to only latch when the button is pushed or released.

③

Symbol:



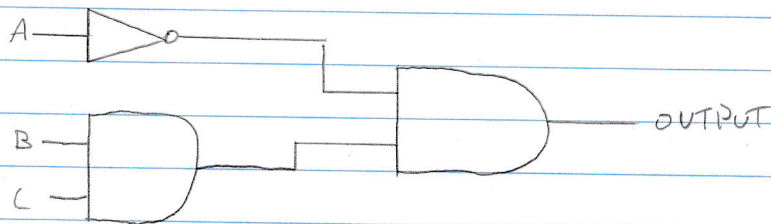
Truth Table:

A	B	Q
0	0	0
0	1	0
1	0	0
1	1	1

④

a) Truth Table:

A	B	C	Output
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	0



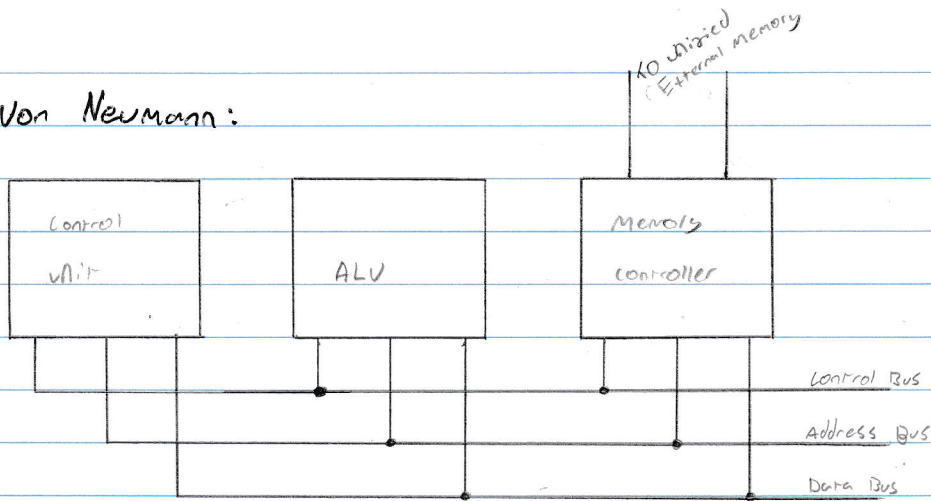
3

3

0

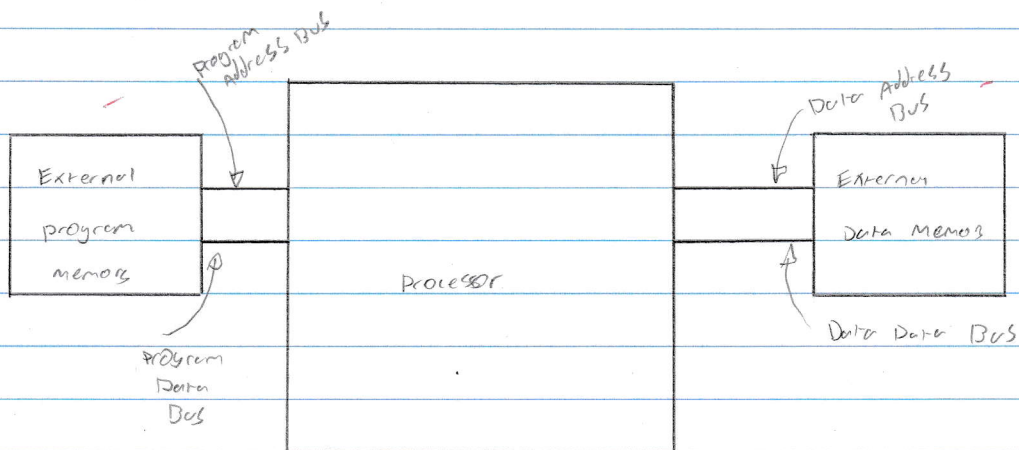
⑤

Von Neumann:



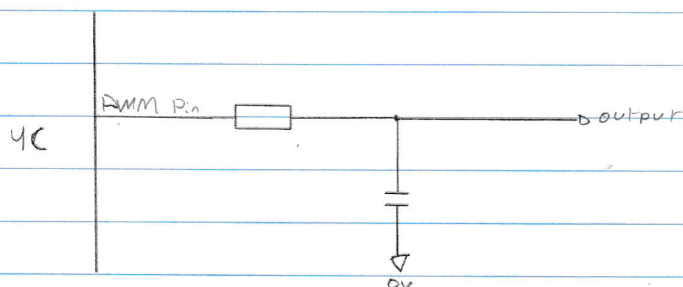
one advantage of this scheme over harvard is its simplicity
only requiring one memory bus and address space

Harvard:



one advantage of Harvard architecture machines is that
~~security issues~~ ~~such as~~ buffer over flow vulnerabilities
would not allow an attacker to ~~read~~ take control of the system
as it could in a von neumann machine.

- ⑥ a DAC can be implemented by placing a ~~low~~ low-pass filter on the PWM output most commonly an RC filter as such:



In this arrangement the capacitor can be thought of as acting to integrate the ~~charge~~ charge flowing across the resistor. Thus by altering the PWM duty cycle the output voltage can be varied. (When the resistor and capacitor are properly sized for the frequency and expected output loadings.)