



Complete, fold and seal
(see note 2 below)

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12 Pages

Instructions to Candidates

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	WAT18840247
2	Title of Examination Paper	Micros Peripherals and Interfaces
3	Module Code	GOEE 4000
4	Date and Time of Examination	17/05/2024 (PM)
5	Examination Venue	Tycoah Main Hall (68860)
6	Seat Number	H2
7	Number of Answer Books handed in	1

[illegible]

RK

Q1: 15/15
Q2: 10/10
Q3: 3/10
Q4: 1/5
Q5: 6.5/10

35.5 / ~~50~~

71%

Q.1

1.1

1.1.1

the control unit acts as the brain of the system, sending and receiving instructions - to and from other subsystems. ✓

Q 1

~~20~~

15/15

1.1.2

Interrupts are separate from the main running of the code, the cause it to stop and run whatever the interrupt is. Once the interrupt has ~~finished~~ finished, the main code can continue. ✓

1.1.3

Memory hierarchy works based off what is fastest to the slowest. Register being some of the quickest but very little, hard drive being the slowest but having the most storage capacity. ✓

1.1.4

DMA (Direct Memory Access) is a form of I/O control, It shares the same address bus as the CPU. ✓

1.1.5

PWM (Pulse Width Modulation) is only available on specific pins of the PIC. It allows you to control the length of a digital pulse. It can be used for DC motors to control its speed. ✓

1.2

High level language is much closer to i.e. the english language, it is sophisticated. assembly language is seen in things like arduinos (c++). Machine language would be found in items like CNC machines. ✓

1.4

Stack operates under (FIFO) first in ~~last~~ out
 queue operates under (FIFO) first in first out

1.5.

Active High:

0	0	$H_i - z$
0	1	$H_i - z$
1	0	0
1	1	1

Active low Inverting:

0	0	1
0	1	0
1	0	$H_i - z$
1	1	$H_i - z$

Q2

Q2.

10/10

- 1 This is the storage device that holds all of the program information. (1)
- 2 EEPROM is erasable read only memory that can hold a limited amount of instructions. (1)
3. Ports that can be set as Inputs or Outputs depending on the desired application. (1)
4. Vref provides a reference voltage that can be compared against, certain components require a reference voltage to function correctly (sensors etc) (1)
- 5 Analogue to digital converter. This allows for analogue sensors or devices to be read digitally - ie. ADC's. (1)
6. the oscillator is the systems clock. Without this, programs would not run. (1)
7. forms of serial communication, SPI operates in a master slave config at full-duplex mode. I²C uses a multi-master bus topology and works in half-duplex mode. (1)
9. Central Processing Unit, This is the brain of the system, everything works off of the instructions given by the CPU. (1)
10. Watch dog Timer - Monitors the running system and looks for errors, It has a failsafe to prevent full lockout. (1)

Q3

3-2 SPI works in full-duplex mode with a master-slave config. It can read/write at the same time. (2)

I²C works in half-duplex mode, with a multi-master bus topology. It can only read or write one at a time. (1)

3-3

a If the interrupt has a higher priority than the current one, it may stop the disk request. also need discuss ISR.

b ~~This~~ This could be a problem X

c It could corrupt/stop the current process, If the code has been done properly, It will know which interrupts have a higher priority at any given time. X

Q3

3/10

24

4.1 Performance to cost ratio $\times$

$$4.2 \quad S = \frac{1}{(1-f) + \frac{f}{K}} \quad \checkmark \quad \textcircled{1}$$

4.3 option 1 - CPU:

$$f = 1.5 \quad f = 0.3$$

$$K = \cancel{0.7} 1.7 \quad K = 1.5$$

$$£ 10000 \quad \checkmark$$

$$S = \frac{1}{(1-1.5) + \frac{1.5}{1.7}} \rightarrow 0.7$$

$$= \cancel{0.61} 2.61$$

$$\frac{10000}{\cancel{0.61} 2.61} = \cancel{16843.04} 3831.4$$

option 2 - Disk:

$$f = 2.5$$

$$K = \cancel{0.3} 1.3$$

$$£ 7000 \quad \times$$

$$S = \frac{1}{(1-2.5) + \frac{2.5}{1.3}} \rightarrow 0.3$$

$$= \cancel{0.18} 2.36$$

$$\frac{£ 7000}{\cancel{0.18} 2.36} = 2966.1$$

CPU is better
as it has a better
performance to value $\times$
number

Q4.

1/5

Q5

S.1 Universal Serial Bus ✓ ①

S.2 • USB Type A
 Type B
 Type C ✗
 Type B - micro

S.3

USB 1.0 = 12 Mb/s
 USB 2.0 = 480 Mb/s ✓ ②
 USB 3.0 = 5 Gb/s
 USB 3.1 = 10 Gb/s

S.4

1. Electrical state of the port is changed ✓
2. host reads device type ✓
3. host locates adequate drivers ✓
4. USB communicates with host ✗
5. host gives task to USB. ✗ ③.5

Q5

6.5/10