e-Quals Unit Syllabus

Level 3 Microprocessors and micro-controllers (7267-527)

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Unit 527 Microprocessors and micro-controllers

Rationale

This unit concerns the technology of microprocessors and micro-controllers.

Learning outcomes

There are **six** performance outcomes for this unit. The candidate will be able to demonstrate an understanding of :

- basic microprocessor and micro-controller systems
- basic input/output devices
- data storage modules
- fault finding procedures
- programming and programming environments for micro-controllers
- programming and programming environments for micro-controllers

Assessment and grading

Assessment will be by means of a **set assignment** covering both practical activities and underpinning knowledge.

Unit 527 Microprocessors and micro-controllers

Outcome 1 Demonstrate an understanding of basic microprocessor and microcontroller systems and software

Underpinning knowledge

The candidate will be able to:

1 explain the meaning of the following terms

- i. bit
- ii. nibble
- iii. byte
- iv. word
- v. instruction
- vi. operator
- vii. operand
- viii. bus
- ix. data
- x. address
- xi. control

2 explain the function of the following sub-systems within a microcomputer system

- i. CPU
- ii. RAM
- iii. ROM
- iv. input/output circuitry
- v. clock
- vi. reset circuitry

3 a state the need for a bus structure and describe

- i. control bus
- ii. address bus
- iii. data bus
- iv. three-state devices

b describe the operation and limitations of the bus structure

c explain the operation of a ‘fetch execute’ cycle

4 a name the main sections and describe their functions within a microprocessor

i. arithmetic logic unit, including the main working register

ii. control unit

iii. data registers

iv. instruction decoder

v. program counter

vi. multiplexer

vii. input and output

b describe the differences between microprocessors in terms of

i. basic architecture

ii. number of address and data lines

iii. speed of operation

iv. number and function of registers

v. packaging

5 a describe typical categories of assembler instructions for a microprocessor

i. arithmetic and logic

ii. data transfer

iii. test and branch

b explain the concept of interrupts and their handling

Unit 527 Microprocessors and micro-controllers

Outcome 2 Demonstrate an understanding of basic input/output devices

Practical activities

The candidate will be able to connect and program a microprocessor system to :

1 accept data from a range of input devices

2 output data to a range of devices.

Underpinning knowledge

The candidate will be able to:

1 a describe the methods of interfacing with the following

- i. switches
- ii. opto transducers and opto couplers
- iii. relays and solid state switches
- iv. light emitting diodes (LED)
- v. piezo and electromagnetic sounders
- vi. keypads

b state the function and operation of the following circuit sub-systems

- i. A/D converters
- ii. D/A converters
- iii. PlO/PIA devices
- iv. UART devices
- v. serial port drivers
- vi. LCD/LED displays and drivers
- vii. high current drivers
- viii. real time clocks

2 a explain the protocols for and operation of data communications systems

- i. serial data transfer
- ii. RS232
- iii. lnter-IC serial buses

b define parallel data transfer

Unit 527 Microprocessors and micro-controllers

Outcome 3 Demonstrate an understanding of data storage devices

Practical activities

The candidate will be able to:

1 program and check read an EPROM memory chip with supplied code

Underpinning knowledge

The candidate will be able to:

1 a explain the need for various types of storage facility in microcomputer/microprocessor based systems

b describe the basic construction and characteristics of the following storage devices

i. hard disk with voice coil actuation

ii. floppy disk

c describe and compare the characteristics of the following memory devices

i. RAM

ii. ROM

iii. PROM

iv. EPROM

v. EAROM

vi. EEPROM

vii. serially addressed memory devices

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Outcome 4 Demonstrate an understanding of fault finding procedures

Practical activities

The candidate will be able to:

1 diagnose a series of faults in a microprocessor system, using a range of test equipment.

Underpinning knowledge

The candidate will be able to:

1 a describe the diagnosis and rectification of common hardware faults in a microprocessor system

b describe the function of equipment used for fault finding on a microprocessor based system, including

i. logic probe

ii. logic pulser

iii. logic clip

iv. oscilloscope

v. breakout box for serial systems

vi. logic analyser

Unit 527 Microprocessors and micro-controllers

Outcome 5 Demonstrate an understanding of programming and programming environments for micro-controllers

Practical activities

The candidate will be able to:

1 use a given programming environment to program, a micro-controller to perform a specified task

2 use a simple program to control the operation of the I/O ports on a micro-controller

3 download the program to the micro-controller, within a target system, and determine the correct operation of the system

4 use in-built features of the programming environment to find and remove faults in the source code.

Underpinning knowledge

The candidate will be able to:

1 a describe the micro-controller as an integrated microprocessor system, optimised for real time applications

b describe the function of the various parts of a micro-controller including the need for

i. watchdog timers

ii. brownout protection

c describe the operation of a typical micro-controller within a given system

2 describe the concept of a programming environment based on a host PC

Unit 527 Microprocessors and micro-controllers

Outcome 6 Demonstrate an understanding of basic customer care and apply this knowledge in a practical situation

Practical activities

The candidate will be able to:

1 process documentation used in conjunction with servicing electrical and electronic equipment.

Underpinning knowledge

The candidate will be able to:

1 explain the importance of the customer's name, correctly spelt and with the correct form of address eg, Mr, Mrs, Miss, Ms)

2 a state procedures to be followed when responding to a service request

- i. obtaining symptoms from the customer
- ii. making a record
- iii. importance of informative quotations provided promptly
- iv. obtaining agreement to proceed with a repair or installation
- v. presenting acceptance documentation

b state procedures to be followed when carrying out a service

- i. respect for customers' possessions and property
- ii. keeping customer informed of progress
- iii. damage caused by misuse and attempts at repair by others
- iv. reporting unsafe situations

c state procedures to be followed when completing a service

- i. issuing informative invoices with terms of business explained
- ii. methods for recording and responding to promises or proposals made to customers
- iii. obligations under the terms of warranties
- iv. warranty on repairs
- v. guarantees
- vi. service agreements

3 explain how to deal with differences of opinion or a difficult relationship with a customer

- i. expression of concern as a first response to complaints
- ii. the negative outcome(s) of customer dissatisfaction

iii. extent of own authority in dealing with complaints

iv. when to seek assistance from others

4 a describe telephone technique

i. avoiding over familiarity

ii. speaking to the right person

iii. leaving messages

iv. follow-up

b explain how to match communication to the customer's ability to understand

i. technical aspects of servicing and installation

ii. selective use of technical jargon

iii. customers with Particular Requirements

iv. calling for assistance where communication difficulties arise

c state the value of questionnaires for seeking feedback and revealing unsatisfied needs

Unit record sheet

Use this form to track your progress through this unit.

Tick the boxes when you have covered each outcome. When they are all ticked, you are ready to be assessed.

Outcome	✓	Date
1 Demonstrate an understanding of basic microprocessor and micro-controller systems	☐	
2 Demonstrate an understanding of basic input/output devices	☐	
3 Demonstrate an understanding of data storage modules	☐	
4 Demonstrate an understanding of fault finding procedures	☐	
5 Demonstrate an understanding of programming and programming environments for micro-controllers	☐	
6 Demonstrate an understanding of basic customer care and apply this knowledge in a practical situation.	☐	

Candidate Signature ..... **Date** .....

City & Guilds Registration Number .....

Quality nominee (if sampled) ..... **Date** .....

Assessor Signature ..... **Date** .....

External Verifier Signature (if sampled) ..... **Date** .....

Centre Name ..... **Centre Number** .....

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