7.3 Structure and role of the processor part 2

Name: _____

Class: _____

Date: _____

Time: **153 minutes**

Marks: **101 marks**

Comments:

Q1.

The contents of a computer word is shown in a debugger as &D15A, where the symbol '&' denotes a hexadecimal number.

(a) What binary pattern does this represent?

_____

(2)

(b) If this represents a memory address, how many address lines will the system bus require if it is to convey the binary equivalent of &D15A?

_____

(1)

(Total 3 marks)

Q2.

Give **two** reasons why some software is still developed in an assembly language.

1. _____

_____

2. _____

_____

(Total 2 marks)

Q3.

A processor with an instruction format of 16 bits and a word length of 16 bits is being used.

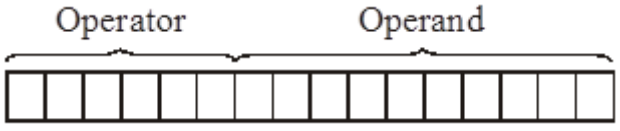
(a) Integers are stored in 2's complement form. What is the possible range of integers that can be stored in a 16-bit word?

_____

_____

(2)

(b) The instruction format uses 6 bits for the operator and 10 bits for the operand.



If direct addressing is used, what is the highest address possible?

_____

_____

(1)

(c) The main registers involved in the fetch-execute cycle are the Program Counter (PC), the Current Instruction Register (CIR), Memory Address Register (MAR) and the Memory Data Register (MDR). List the **steps** of the fetch-execute cycle, including how the above registers are used.

_____

_____

_____

_____

_____

_____

(6)

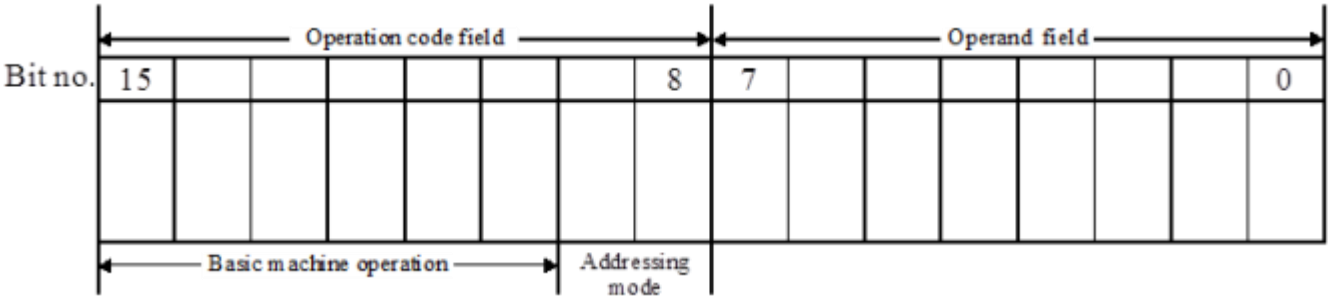
(Total 9 marks)

Q4.

A computer design company has produced a design for an elementary computer. It is to be used to teach students about machine architecture, machine operations and the design of an *instruction set*.

The current instruction register has a length of 16 bits.
The accumulator has a length of 16 bits.
The size of each memory location is 16 bits.
The current instruction register is designed to hold one instruction at a time.
A machine instruction is 16 bits in length.
The most significant eight bits of a machine instruction denote the machine operation.
The least significant bits denote an operand or the address of an operand.
Main memory stores both instructions and data.

The structure of a machine instruction is as follows.



(a) Define the term instruction set.

_____

_____

(1)

(b) With 6 bits of the operation code reserved to denote basic machine operations, how

many basic machine operations may be coded?

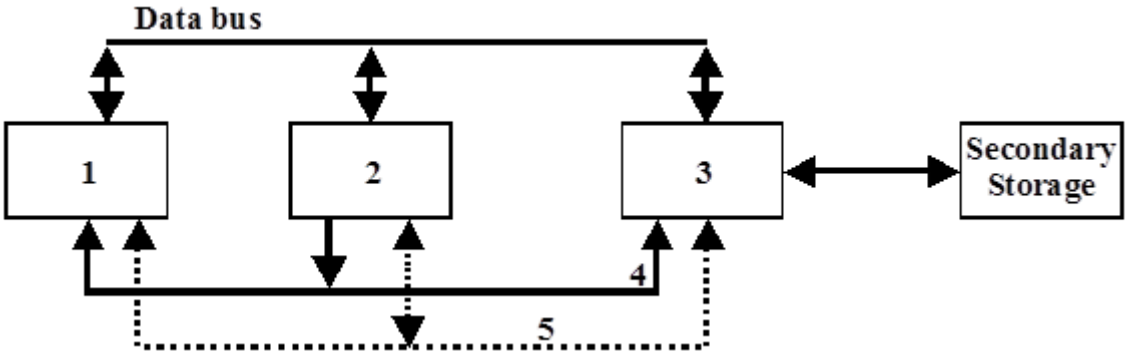
_____

(1)

(Total 2 marks)

Q5.

Some of the components of a computer system are processor, main memory, address bus, data bus, control bus, I/O port and secondary storage.



The diagram above shows how these components are connected.

(a) Name each of the following:

1. _____

2. _____

3. _____

4. _____

5. _____

(5)

(b) (i) What is the function of the following components:

processor; _____

_____

main memory; _____

_____

secondary storage? _____

(3)

(ii) Give **two** examples of a signal carried by the control bus.

1. _____

2. _____

(2)

(iii) Apart from data, what else is carried on the data bus?

_____

(1)

(Total 11 marks)

Q6.

(i) In order to process data, a sequence of operations is frequently required. As each of these operations is executed, where are the results stored?

_____

_____

(1)

(ii) Why is it more efficient storing intermediate results in this location rather than in main memory (IAS)?

_____

_____

(2)

(Total 3 marks)

Q7.

(a) What is a *register* in a computing context?

_____

_____

(1)

(b) Give **one** reason for using general purpose registers rather than main memory.

_____

_____

(1)

(c) Some registers are used in the processor for a specific purpose. Name **three** such registers and explain the purpose of each one.

1. Name _____

   Purpose _____

   _____

2. Name _____

   Purpose _____

   _____

   _____

3. Name _____

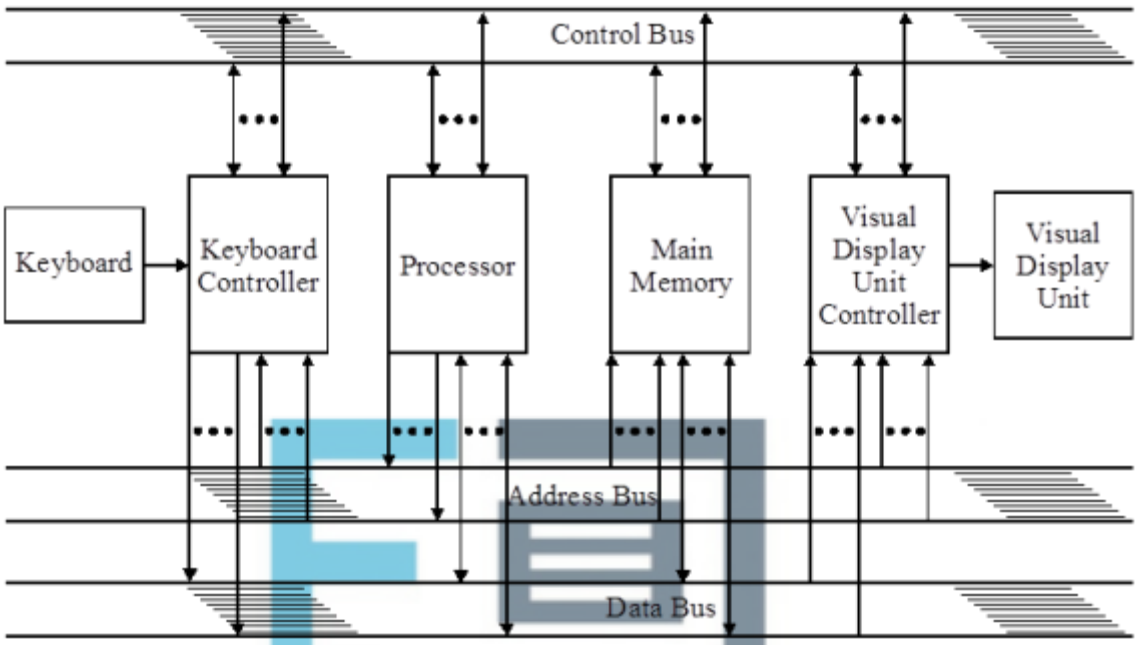
Purpose _____

_____

(3)

(Total 5 marks)

Q8.



The figure above is a block diagram showing the bus architecture of a typical microcomputer. A device controller is a hardware unit which is attached to the bus system of the computer to provide a hardware interface between a computer and a device such as a keyboard.

(a) Why are devices **not** connected directly to the processor?

_____

_____

(2)

(b) Name **one** other device controller which may be found in a typical microcomputer.

_____

(1)

(c) The data bus carries data in both directions. Explain why the address bus only carries addresses in one direction.

_____

_____

(2)

(d) Name and describe the function of **two** signal lines that are usually present in a control bus.

1. Name _____

Function _____

_____

2. Name _____

Function _____

_____

(4)

(Total 9 marks)

Q9.

(a) Some of the basic components of a computer system are processor, main memory, and secondary storage.

(i) What connects the processor and main memory?

_____

(1)

(ii) What is the purpose of secondary storage?

_____

_____

(1)

(iii) Describe what happens during the fetch-execute cycle.

_____

_____

_____

_____

(2)

(b) (i) Machine code is the first generation programming language. What is the second generation?

_____

(1)

(ii) A programmer writes a program in a second generation programming language.
What has to be done to this program before it can be executed?

_____

_____

_____

_____

(2)

(iii) Some high level languages are classified as *imperative*. What is meant by imperative?

_____

_____

(1)

(iv) Give an example of an imperative high level language.

_____

(1)

(v) What is the relationship between an imperative high level language statement and its machine code equivalent?

_____

_____

(1)

(vi) Give **two** disadvantages of programming in first and second generation programming languages compared with imperative high level languages.

1. _____

_____

2. _____

_____

(2)

(Total 12 marks)

Q10.

Some personal computers are referred to as 32-bit machines. This means their word length is 32 bits.

(a) What is a word in this context?

_____

_____

(1)

(b) State the different values for one bit. _____

(1)

(c) Give **three** different interpretations which can be associated with a pattern of bits in

a 32-bit word.

1. _____

2. _____

3. _____

(3)

(Total 5 marks)

Q11.

(a) In the context of a computer processor, define the term *Clock Speed*.

_____

_____

(1)

(b) Explain how the clock speed affects the speed at which instructions can be executed.

_____

_____

(1)

(Total 2 marks)

Q12.

Registers are involved in the fetch part of the fetch-execute cycle.

Name **three** of these registers, describe what each will store, and give **one** further detail about its role.

1 Name the register _____

What does it store? _____

Further detail _____

2 Name the register _____

What does it store? _____

Further detail _____

3 Name the register _____

What does it store? _____

Further detail _____

(Total 9 marks)

Q13.

Newspapers and magazines are advertising many different specifications of personal

computer systems. Such advertisements feature monitor, disk drives, processor, main memory and operating system.

(a) What is the purpose of an operating system?

_____

_____

(1)

(b) What is the function of:

(i) the processor;

_____

_____

(1)

(ii) main memory (Immediate Access Store)?

_____

_____

(1)

(c) The system bus in a computer system is made up of three buses. Name each bus and give **one** example of its use.

1. Name_____

(1)

Example_____

_____

(1)

2. Name_____

(1)

Example_____

_____

(1)

3. Name_____

(1)

Example_____

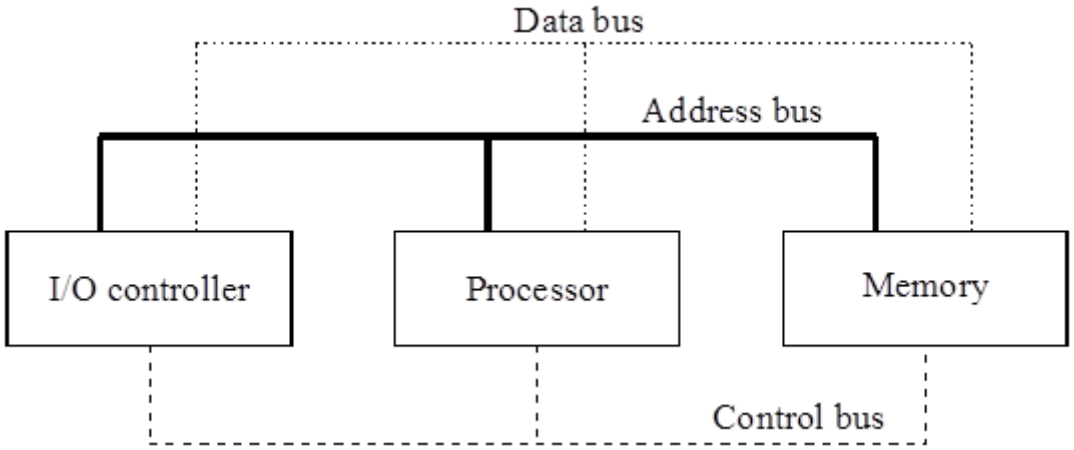
_____

(1)

(Total 9 marks)

Q14.

The diagram shows **three** main components of a computer which are linked by the control bus, the address bus and the data bus.



(a) Show clearly on the diagram the directions in which signals travel along all **three** buses.

(3)

(b) Give **two** different interpretations of the data which could be sent along the data bus.

1. _____

_____

2. _____

_____

(2)

(c) What type of information is carried by the control bus?

_____

(1)

(Total 6 marks)

Q15.

Name and briefly describe the purpose of **three** buses found within a computer.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(Total 6 marks)

Q16.

(a) Name and briefly describe the **two** types of *low level* programming languages.

1. _____

_____

_____

_____

_____

_____

(3)

2. _____

_____

_____

_____

_____

_____

(3)

(b) Give **one** reason why programmers still use a low level language on occasion.

_____

_____

(1)

(Total 7 marks)

Q17.

Name **one** register involved in the fetch part of the fetch-execute cycle.

_____

_____

(Total 1 mark)

EXAM PAPERS PRACTICE