

Past Papers May/June 2015 to 2018:

9608/11/M/J/15

Q8(a) Explain how the width of the data bus and system clock speed affect the performance of a computer system.

Width of the data bus
.....
.....

Clock speed
.....
.....

.....[3]
(b) Most computers use Universal Serial Bus (USB) ports to allow the attachment of devices. Describe two benefits of using USB ports.

1
.....

2
.....[2]

(c) The table shows six stages in the von Neumann fetch-execute cycle.
Put the stages into the correct sequence by writing the numbers 1 to 6 in the right hand column.

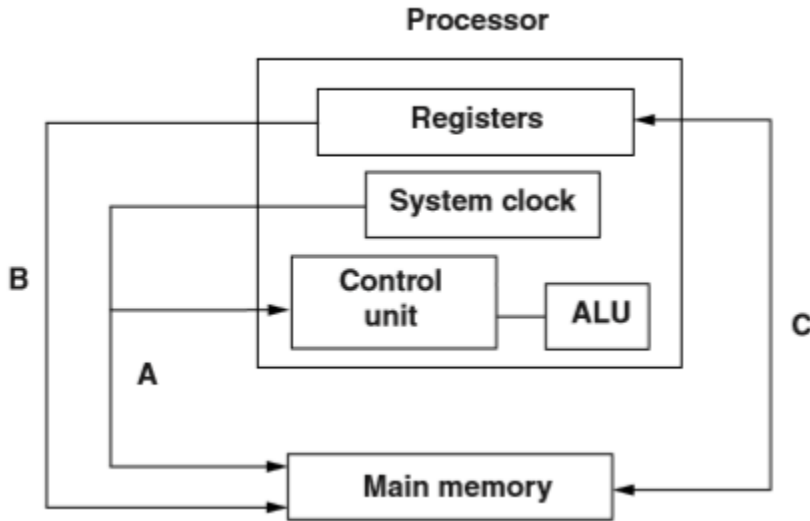
| Description of stage | Sequence number |
|---|-----------------|
| the instruction is copied from the Memory Data Register (MDR) and placed in the Current Instruction Register (CIR) | |
| the instruction is executed | |
| the instruction is decoded | |
| the address contained in the Program Counter (PC) is copied to the Memory Address Register (MAR) | |
| the value in the Program Counter (PC) is incremented so that it points to the next instruction to be fetched | |
| the instruction is copied from the memory location contained in the Memory Address Register (MAR) and is placed in the Memory Data Register (MDR) | |

[6]



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2 (a) The diagram below shows a simplified form of processor architecture.



Name the three buses labelled A, B and C.

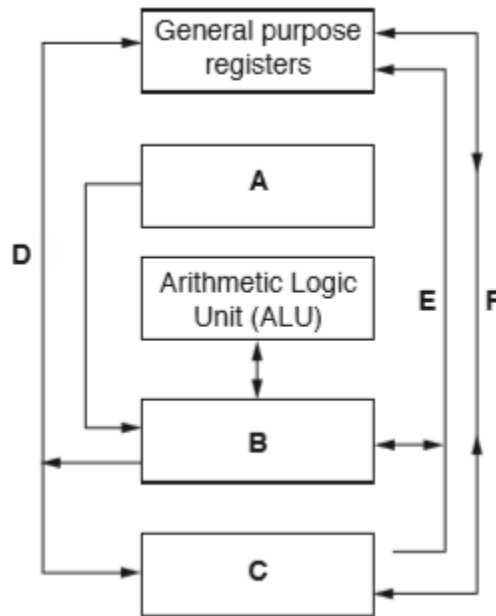
- A
- B
- C [3]

(b) State the role of each of the following special purpose registers used in a typical processor.







- Program Counter [4]
- Memory Data Register
- Current Instruction Register
- Memory Address Register

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4 (a) The diagram shows the components and buses found inside a typical Personal Computer (PC).



Some components and buses only have labels A to F to identify them. For each label, choose the appropriate title from the following list. The title for label D is already given.

-  Control bus
-  System clock
-  Data bus
-  Control unit
-  Main memory
-  Secondary storage

A

B

C

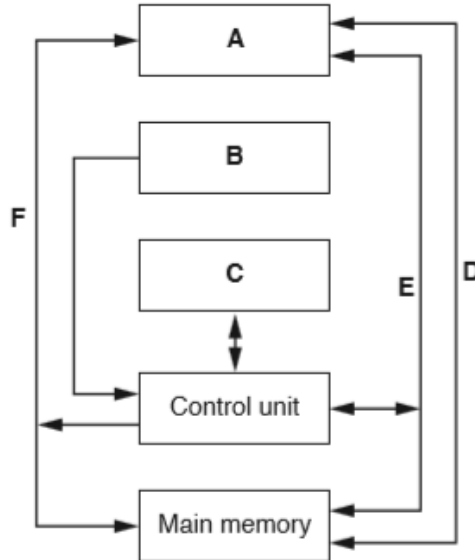
D Address bus

E







F [5]

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4 The following diagram shows the components and buses found inside a typical personal computer (PC).



(a) Some components and buses only have labels A to F to identify them. For each label, choose the appropriate title from the following list. The title for label D is already given.

-  Control bus
-  Address bus
-  Arithmetic Logic Unit (ALU)
-  General purpose registers
-  Secondary storage
-  System clock

A

B

C

D Data bus

E

F [5]

(b) Clock speed is a factor that affects the performance of a PC. Explain this statement.

.....
.....
.....[2]





Answer

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Q8(a)

8 (a) maximum of 2 marks for data bus width and maximum of 2 marks for clock speed








Data bus width

-  the width of the data bus determines the number of bits that can be simultaneously transferred
-  increasing the width of the data bus increases the number of bits/amount of data that can be moved at one time (or equivalent)
-  ...hence improving processing speed as fewer transfers are needed
-  By example: e.g. double the width of the data bus moves 2x data per clock pulse

Clock speed

-  determines the number of cycles the CPU can execute per second
-  increasing clock speed increases the number of operations/number of fetch-execute cycles that can be carried out per unit of time
-  ...however, there is a limit on clock speed because the heat generated by higher clock speeds cannot be removed fast enough [3]

(b) Any two from:

-  devices automatically detected and configured when first attached/plug and play
-  it is nearly impossible to wrongly connect a device
-  USB has become an industrial standard
-  supported by many operating systems
-  USB 3.0 allows full duplex data transfer
-  later versions are backwards compatible with earlier USB systems
-  allows power to be drawn to charge portable devices [2]

(c)

| Description of stage | Sequence number |
|---|-----------------|
| the instruction is copied from the Memory Data Register (MDR) and placed in the Current Instruction Register (CIR) | 3 |
| the instruction is executed | 6 |
| the instruction is decoded | 5 |
| the address contained in the Program Counter (PC) is copied to the Memory Address Register (MAR) | 1 |
| the value in the Program Counter (PC) is incremented so that it points to the next instruction to be fetched | 4 |
| the instruction is copied from the memory location contained in the Memory Address Register (MAR) and is placed in the Memory Data Register (MDR) | 2 |

[6]

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ANSWERS

2 (a) A = control bus

B = address bus

C = data bus

[3]

(b) Program Counter – stores the address of next instruction to be executed

Memory Data Register – stores the data in transit between memory and other registers // holds the instruction before it is passed to the CIR

Current Instruction Register – stores the current instruction being executed

Memory Address Register – stores the address of the memory location which is about to be accessed

[4]

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4 (a)

| Question | Answer | Marks |
|----------|--|-------|
| 4(a) | A – System clock B – Control unit C – Main memory E – Control bus F – Data bus | 5 |

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| Question | Answer | Marks |
|----------|--|-------|
| 4(a) | 1 Mark for each correct answer A – General purpose registers B – System clock C – ALU E – Control bus F – Address bus | 5 |
| 4(b) | 1 Mark per bullet, max 2 <input type="checkbox"/> The clock sends out a number of pulses in a given time interval (clock speed) <input type="checkbox"/> Each processor instruction takes a certain number of clock cycles to execute <input type="checkbox"/> The higher the clock frequency, the shorter the execution time for the instruction // Increasing the clock frequency improves performance | 2 |