A-level

COMPUTER SCIENCE

Paper 2

7517/2

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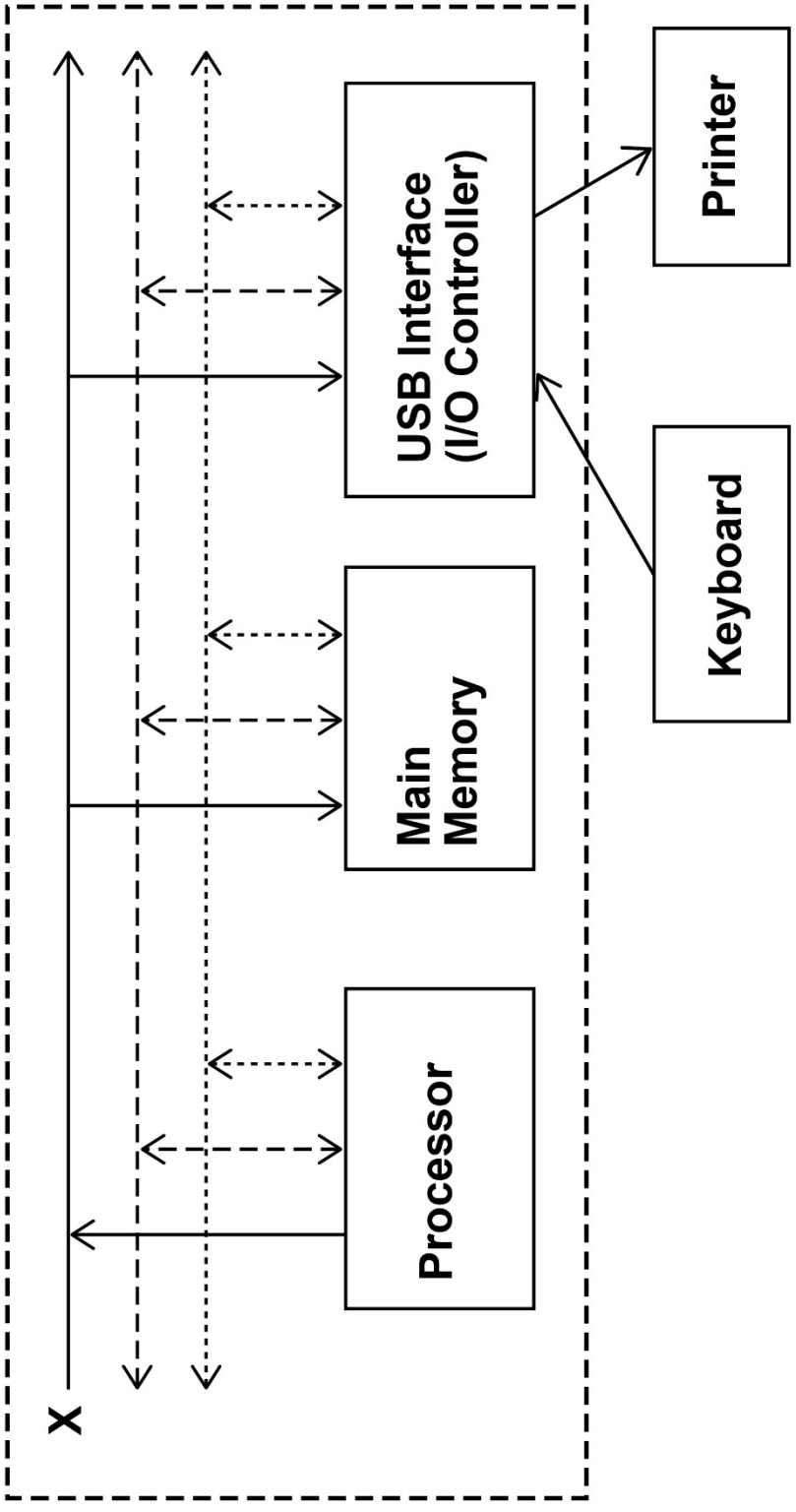
X
Processor
Main Memory
USB Interface (I/O Controller)
Printer
Keyboard

FIGURE 1

FIGURE 2

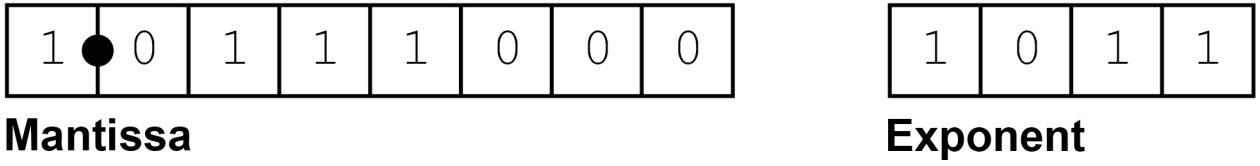

FIGURE 3

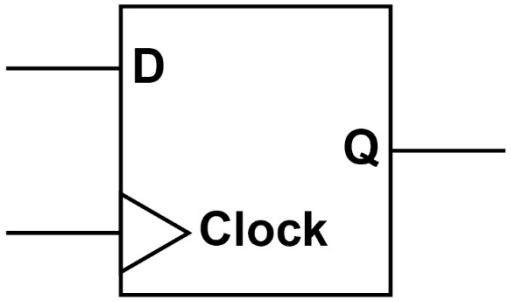

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FIGURE 5

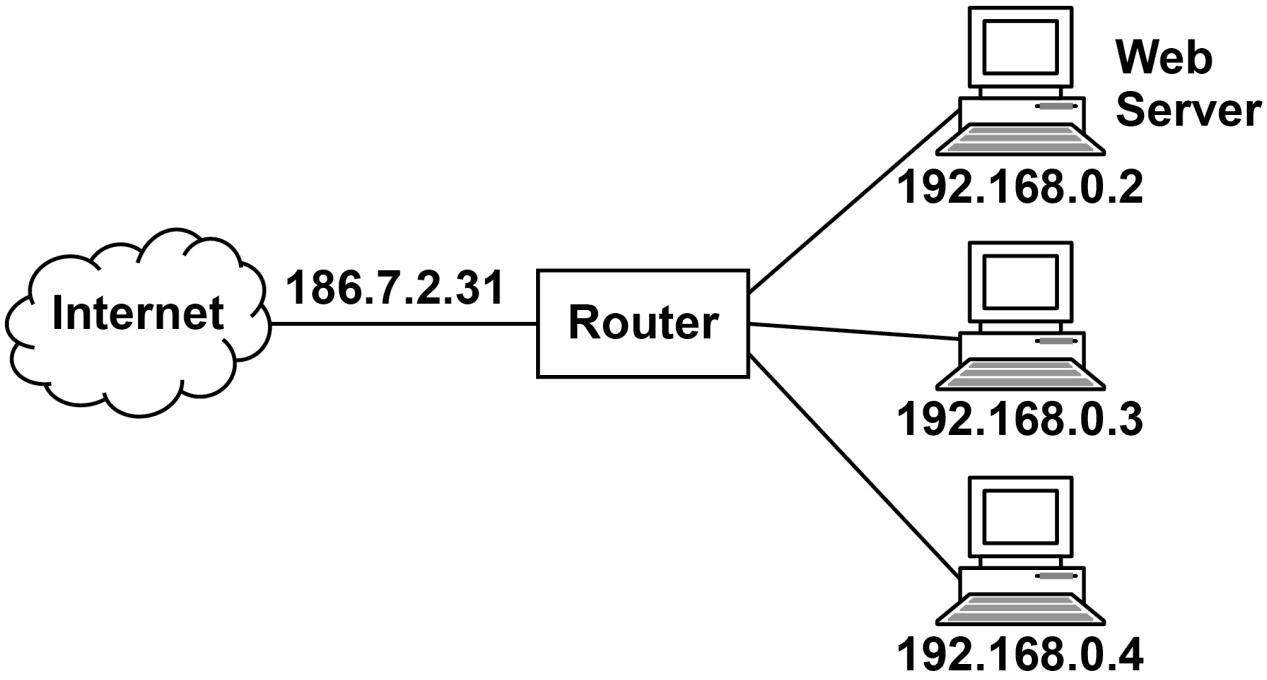
Web
Server
192.168.0.2
Internet
186.7.2.31
Router
192.168.0.3
192.168.0.4

FIGURE 6

Product(<u>ProductID</u>, Description, QuantityInStock, SupplierID)

Sale(<u>SaleID</u>, CustomerID, SaleDate)

SaleLine(<u>SaleID, ProductID</u>, QuantitySold)

Customer(<u>CustomerID</u>, Forename, Surname, EmailAddress)

Supplier(<u>SupplierID</u>, SupplierName, SupplierEmail)

[Turn over]

TABLE 1

This table is included so that you can answer Question 10.1

TABLE 1 Standard AQA assembly language instruction set

`LDR Rd, <memory ref>`	**Load the value stored in the memory location specified by** `<memory ref>` **into register** `d`
`STR Rd, <memory ref>`	**Store the value that is in register** `d` **into the memory location specified by** `<memory ref>`
`ADD Rd, Rn, <operand2>`	**Add the value specified in** `<operand2>` **to the value in register** `n` **and store the result in register** `d`
`SUB Rd, Rn, <operand2>`	**Subtract the value specified by** `<operand2>` **from the value in register** `n` **and store the result in register** `d`
`MOV Rd, <operand2>`	**Copy the value specified by** `<operand2>` **into register** `d`
`CMP Rn, <operand2>`	**Compare the value stored in register** `n` **with the value specified by** `<operand2>`
`B <label>`	**Always branch to the instruction at position** `<label>` **in the program.**

B<condition> <label>	**Branch to the instruction at position** <label> **if the last comparison met the criterion specified by** <condition>**. Possible values for** <condition> **and their meanings are:** EQ**: equal to** NE**: not equal to** GT**: greater than** LT**: less than**
AND Rd, Rn, <operand2>	**Perform a bitwise logical AND operation between the value in register** n **and the value specified by** <operand2> **and store the result in register** d
ORR Rd, Rn, <operand2>	**Perform a bitwise logical OR operation between the value in register** n **and the value specified by** <operand2> **and store the result in register** d
EOR Rd, Rn, <operand2>	**Perform a bitwise logical XOR (exclusive or) operation between the value in register** n **and the value specified by** <operand2> **and store the result in register** d

TABLE 1 continues on the next page

MVN Rd, <operand2>	**Perform a bitwise logical NOT operation on the value specified by** <operand2> **and store the result in register** d
LSL Rd, Rn, <operand2>	**Logically shift left the value stored in register** n **by the number of bits specified by** <operand2> **and store the result in register** d
LSR Rd, Rn, <operand2>	**Logically shift right the value stored in register** n **by the number of bits specified by** <operand2> **and store the result in register** d
HALT	**Stops the execution of the program.**

LABELS: A label is placed in the code by writing an identifier followed by a colon (:). To refer to a label, the identifier of the label is placed after the branch instruction.

INTERPRETATION OF <operand2>

<operand2> **can be interpreted in two different ways, depending on whether the first character is a # or an R:**

- # **– use the decimal value specified after the** #**, eg** #25 **means use the decimal value 25**

- `Rm` **– use the value stored in register** `m`**, eg** `R6` **means use the value stored in register 6**

The available general-purpose registers that the programmer can use are numbered 0–12

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FIGURE 7

```
  LDR R1, 130
  MOV R2, #0
  MOV R4, #0
repeat:
  ADD R2, R2, #1
  AND R3, R1, #1
  CMP R3, #0
  BEQ skip
  ADD R4, R4, #1
skip:
  LSR R1, R1, #1
  CMP R2, #7
  BNE repeat
  LDR R1, 130
  AND R4, R4, #1
  CMP R4, #0
  BNE else
  ORR R1, R1, #128
  B end
else:
```

```
  AND R1, R1, #127
end:
  STR R1, 130
  HALT
```

The program performs a task on a value stored in memory location 130. The value in this memory location is a 7-bit ASCII code.

For example, if memory location 130 was used to store the ASCII character 'S' then it would contain the value 83, which in binary is:

0	**1**	**0**	**1**	**0**	**0**	**1**	**1**

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