A Level · OCR · Computer Science

19 mins 7 questions

Exam Questions

1.1 Structure & Function of the Processor

Components of the CPU / Fetch-Decode-Execute Cycle / CPU Performance / Pipelining / Von Neumann & Harvard Architecture

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Total Marks /19

1 A charity uses a desktop computer to record financial donations that it receives. The computer contains a single core, 2.4GHz processor with 2MB cache.

The processor contains registers including the accumulator and the program counter. The contents of these registers are modified during the Fetch-Decode-Execute cycle.

State the name of three **other registers** that are used during the Fetch-Decode-Execute cycle.

.....

.....

.....

(3 marks)

2 A program written using the Little Man Computer instruction set is shown in Fig. 1.

```
         INP
         STA  numone
         INP
         STA  numtwo
main     LDA  numone
         SUB  numtwo
         BRP  pos
notpos   LDA  count
         OUT
         LDA  numone
         OUT
         HLT
pos      STA  numone
         LDA  count
         ADD  one
         STA  count
         BRA  main
numone   DAT
numtwo   DAT
one      DAT  1
count    DAT  0
```

Various **registers** are used when the program above is executed.

State what is meant by the term 'register'.

.....

.....

(2 marks)

3 OCR Insurance uses a computer system to calculate the price that customers pay for car insurance.

The computer system contains a CPU, GPU, RAM and ROM

State two factors that affect the performance of a CPU.

.....

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(2 marks)

4 (a) **Fig. 1** shows assembly code written using the Little Man Computer (LMC).

The program calculates and outputs the total amount that is donated to a charity in any particular day. Depending on the amount, an additional bonus may be added to each amount donated.

```
start       INP
            STA donation
            SUB hundred
            BRP bonus
nobonus     LDA total
            ADD donation
            STA total
            OUT
            BRA start
bonus       LDA total
            ADD donation
            ADD twenty
            STA total
            OUT
            BRA start
hundred     DAT 100
twenty      DAT 20
donation    DAT 0
total       DAT 0
```

This program is run on a processor that allows **pipelining**.

Define the term '**pipelining**'.

.....

.....

.....

(3 marks)

(b) **Explain one benefit** to the charity of using a processor that allows pipelining.

.....

.....

(2 marks)

5 The CPU uses **pipelining** to improve efficiency.

Explain what is meant by the term 'pipelining'

(3 marks)

6 **Explain why** pipelining can improve the performance of the processor.

(2 marks)

7 A program written using the Little Man Computer instruction set is shown in Fig. 1

```
          INP
          STA  numone
          INP
          STA  numtwo
main      LDA  numone
          SUB  numtwo
          BRP  pos
notpos    LDA  count
          OUT
          LDA  numone
          OUT
          HLT
pos       STA  numone
          LDA  count
          ADD  one
          STA  count
          BRA  main
numone    DAT
numtwo    DAT
one       DAT  1
count     DAT  0
```

Various registers are used when the program above is executed.

Explain how the **accumulator** is used when the line BRP pos is executed.

(2 marks)