1.1 Structure and Function of the Processor: 10-minute Pack

Total Marks

OCR H446 · Calculators not allowed · about 10 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A simple program is stored in main memory as follows:
address 100: LDD 200 (load the value directly from address 200 into the accumulator)
address 101: ADD 201 (add the value directly from address 201 to the accumulator)
address 102: STO 202 (store the value in the accumulator directly to address 202)
address 200: 15
address 201: 9
address 202: (currently empty)
The Program Counter starts at 100.

(a) Complete the trace table for the fetch stage of the instruction at address 100 (LDD 200) by giving the value placed in each register after each RTN step. **(4)**
Step 1: MAR <- [PC] MAR = ?
Step 2: PC <- [PC]+1 PC = ?
Step 3: MDR <- [[MAR]] MDR = ?
Step 4: CIR <- [MDR] CIR = ?

(b) State the register transfer notation for the execute stage of LDD 200, and give the resulting value held in the Accumulator (ACC). **(2)**

(c) Using the same method, state the value held in the Accumulator after the instruction at address 101 (ADD 201) has been executed. **(2)**

(d) State the value written to memory address 202 once the instruction at address 102 (STO 202) has been executed. **(1)**

(e) Convert the memory address 202 (denary) to hexadecimal. Show your working. **(1)**

(Total for Question 1 is 10 marks)

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Mark scheme · 1.1 Structure and Function of the Processor: 10-minute Pack

Question 1

(a) MAR = 100, cao **B1**

(a) PC = 101, cao **B1**

(a) MDR = LDD 200, cao (the instruction stored at address 100) **B1**

(a) CIR = LDD 200, ft from MDR **B1**

(a) Answer: MAR = 100, PC = 101, MDR = LDD 200, CIR = LDD 200

(b) MAR <- [CIR operand] (i.e. MAR <- 200); MDR <- [[MAR]]; ACC <- [MDR], oe (any correct logic, ignore minor notation differences) **M1**

(b) ACC = 15, cao **A1**

(b) Answer: ACC <- [MDR] where MDR holds the value at address 200; ACC = 15

(c) ACC <- [ACC] + [MDR], where MDR holds the value fetched from address 201 (value 9), oe **M1**

(c) ACC = 24, cao (ft from part b if a different value for ACC was carried forward consistently) **A1**

(c) Answer: ACC = 24

(d) 24, cao (ft from part c) **B1**

(d) Answer: 24

(e) CA, cao (working shown, e.g. 202 = 12x16 + 10) **B1**

(e) Answer: CA

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