

6 The following table shows part of the instruction set for a processor. The processor has two registers: the Accumulator (ACC) and the Index Register (IX).

Instruction		Explanation
Opcode	Operand	
LDM	#n	Immediate addressing. Load the number n to the ACC
AND	#n / Bn / &n	Bitwise AND operation of the contents of the ACC with the operand
AND	<address>	Bitwise AND operation of the contents of the ACC with the contents of <address>
XOR	#n / Bn / &n	Bitwise XOR operation of the contents of the ACC with the operand
XOR	<address>	Bitwise XOR operation of the contents of the ACC with the contents of <address>
OR	#n / Bn / &n	Bitwise OR operation of the contents of the ACC with the operand
OR	<address>	Bitwise OR operation of the contents of the ACC with the contents of <address>
CMP	#n	Compare the contents of the ACC with number n
CMP	<address>	Compare the contents of the ACC with the contents of <address>
LSL	#n	Bits in the ACC are shifted logically n places to the left. Zeros are introduced on the right-hand end
LSR	#n	Bits in the ACC are shifted logically n places to the right. Zeros are introduced on the left-hand end

<address> can be an absolute or symbolic address  
 # denotes a denary number, e.g. #127  
 B denotes a binary number, e.g. B10010001  
 & denotes a hexadecimal number, e.g. &4A

The current contents of main memory are shown:

Address	Data
100	0000 0011
101	1010 1110
102	1100 1100
103	1111 1111
104	1100 1100

(a) Complete the table by writing the contents of the ACC after the execution of each instruction.

Current contents of the ACC	Instruction	Contents of the ACC after the execution of the instruction
0000 1111	AND 101	
0000 0000	LDM #100	
0000 0001	XOR &F1	
0001 0001	CMP 101	

[4]

(b) The Von Neumann model for a computer system uses registers.

Describe the role of the Memory Address Register (MAR) and Memory Data Register (MDR) in the fetch-execute (F-E) cycle.

.....  
 .....  
 .....  
 .....  
 .....  
 .....  
 .....  
 ..... [4]

(c) Assembly language instructions are grouped.

Complete each statement by writing the name of the appropriate instruction group.

Loading data into the accumulator is an example of an instruction in the ..... group. Incrementing the index register is an example of an instruction in the ..... group. Branching to another address is an example of an instruction in the ..... group. [3]