

3 (a) (i) State what is meant by relative addressing.

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 [1]

(ii) Registers such as the Accumulator (ACC) and the Index Register (IX) are used in the CPU.

Identify **two** special purpose registers used in the CPU. Do **not** include the ACC or IX in your answers.

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2 [2]

(b) The following table shows part of the instruction set for a processor. The processor has two registers: the ACC and an IX.

| Instruction | | Explanation |
|-------------|-----------|---|
| Opcode | Operand | |
| LDM | #n | Immediate addressing. Load the number n to ACC |
| LDD | <address> | Direct addressing. Load the contents of the location at the given address to ACC |
| LDI | <address> | Indirect addressing. The address to be used is at the given address. Load the contents of this second address to ACC |
| LDX | <address> | Indexed addressing. Form the address from <address> + the contents of the index register. Copy the contents of this calculated address to ACC |
| LDR | #n | Immediate addressing. Load the number n to IX |

<address> can be an absolute or symbolic address
 # denotes a denary number, e.g. #127

The current contents of the main memory and the index register are shown.

| Address | Instruction |
|---------|-------------|
| 98 | 8 |
| 99 | 16 |
| 100 | 3 |
| 101 | 98 |
| 102 | 32 |
| IX | 2 |

Write the contents of the ACC after each instruction is executed.

| Instruction | Value in ACC |
|-------------|--------------|
| LDM #98 | |
| LDI 101 | |
| LDX 100 | |

[3]

(c) A student buys a new computer. The table shows the specifications of the old computer and the new computer.

| Old computer | New computer |
|----------------------------|----------------------------|
| 1.8GHz dual core processor | 2.3GHz dual core processor |
| 16MB cache | 32MB cache |

Explain why increasing the clock speed **and** increasing the cache memory will improve the performance of the computer.

Clock speed

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Cache memory

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[4]