

3.7. Computer Organisation and Architecture – Test 2

1. a) Explain why RAM is primary storage and a hard disk is secondary storage. [2]

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- b) Explain the concept of 'addressable memory'. [2]

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2. Fill in the missing details on the following: [3]

Name	Role
Data bus	
	Carries the details that are required in order to keep operations running at the correct time
Address bus	

3. Explain how the following can affect the performance of a processor.

- a) Clock speed [2]

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- b) Word length [2]

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4. Use the following list of machine-code instructions to answer the next two questions.

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>	Conditionally branch to the instruction at position <label> in the program if the last comparison met the criteria specified by the <condition>. Possible values for <condition> and their meaning are: <ul style="list-style-type: none"> • 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 exclusive or (XOR) operation between the value in register n and the value specified by <operand2> and store the result in register d.
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.

a) Explain what 'immediate addressing' is and show how immediate addressing is used by giving an example that uses the CMP instruction. [2]

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Example:

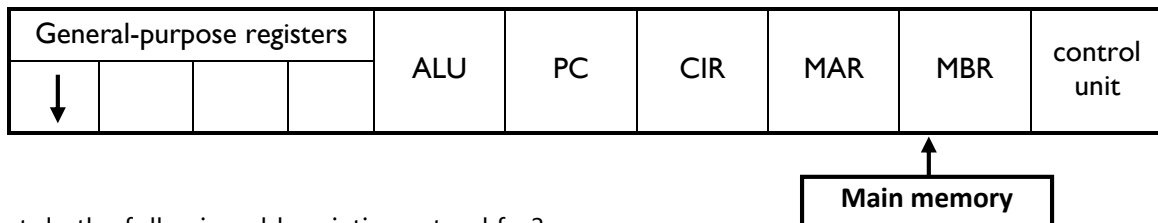
b) Consider the following code written in a high-level language:

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IF X < 7
    THEN B ← 15
END IF
    
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Write a sequence of assembly-language instructions that would perform the same operations as the program code above. Assume that register R1 currently stores the value associated with X, register R2 stores the value currently associated with B and that register R3 is available for general use, if necessary. [4]

5) This diagram shows memory used by the processor.



What do the following abbreviations stand for?

- a) PC [1]
- b) CIR [1]
- c) MAR [1]
- d) MBR..... [1]

6. Common secondary storage devices used by computers include hard disk drives (HDD), optical discs, and solid state drives (SSD).

Give one advantage and one disadvantage for each type. [6]

Storage Device	Advantage	Disadvantage
HDD		
Optical discs		
SSD		

7. A school is considering changing from using paper registers to storing all the register information on a computer.

a) Briefly describe two technologies that could be used to help enter data into the computer. [2]

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b) Outline the potential advantages and disadvantages of storing the information on a computer rather than in a register. [4]

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Total marks = /33