

حل N/D
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Q1) Answer briefly on the following questions [30 points]

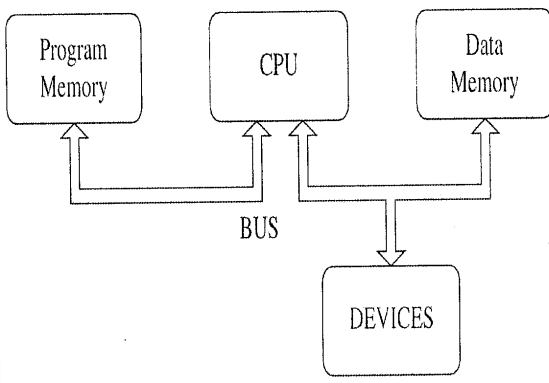
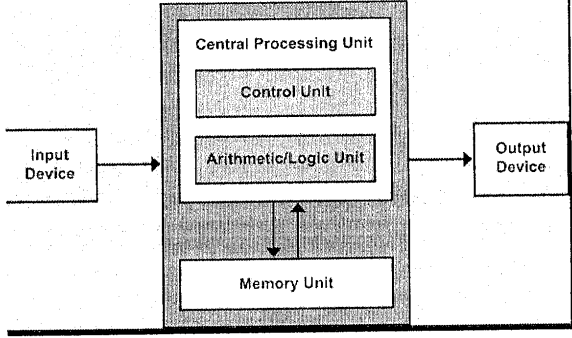
$a_3, a_8, a_{13}, b_2, c_2$

1. What, in general terms, is the distinction between computer organization and computer architecture?

Computer architecture - refers to those attributes of a system visible to a programmer, ie: those attributes that have a direct impact on the logical execution of a program. Eg: instruction set, the number of bits used to represent various data types, I/O mechanisms, and techniques for addressing memory.

Computer organization - refers to the operational units and their interconnections that realize the architectural specifications. Eg: control signals, interfaces between computer and peripherals, and memory technology.

2. Distinguish Von-Neumann Architecture with a simple drawing.

Harvard	Von-Neumann
<ul style="list-style-type: none"> - Two memories with two Buses allow parallel access to data access and instructions. - Control unit for two buses is more complicated and more expensive. - Program cannot write itself. - Both memories can use different sizes. - Development of a complicated Control Unit needs more time. - Free data memory can't be used for instruction and vice-versa. 	<ul style="list-style-type: none"> - Content of the memory if organized and all installed memory can be used. - One bus is simpler for the control unit design - Computer with one bus is cheaper. - Error in a program can rewrite instruction and crash program execution. - Development of the Control Unit is cheaper and faster. - Data and instruction is accessed in the same way. - One Bus (for Data, instruction and devices) is a bottleneck.
 <p>The diagram shows a central CPU box. To its left is a box labeled 'Program Memory' and to its right is 'Data Memory'. Below the CPU is a box labeled 'DEVICES'. A horizontal line labeled 'BUS' runs through the center. Arrows point from the CPU to the Program Memory and Data Memory. Arrows also point from the DEVICES to the CPU. The Program Memory and Data Memory are connected to the BUS, which in turn connects to the CPU.</p>	 <p>The diagram shows a large box labeled 'Central Processing Unit'. Inside this box are three smaller boxes: 'Control Unit' at the top, 'Arithmetic/Logic Unit' in the middle, and 'Memory Unit' at the bottom. Arrows indicate bidirectional communication between the Control Unit and the Arithmetic/Logic Unit, and between the Arithmetic/Logic Unit and the Memory Unit. To the left of the CPU box is an 'Input Device' with an arrow pointing into the CPU. To the right is an 'Output Device' with an arrow pointing out from the CPU.</p>

3. What is the difference between RISC and CISC? Give example for each.

S.N.	RISC	CISC
1	Simple instructions taking one cycle	Complex instructions taking multiple cycles
2	Only load and store memory references	Any instructions may reference memory
3	Heavily pipelined	Not/less pipelined
4	Multiple register sets	Single register set
5	Complexity is in compiler	Complexity is in micro-programming
6	Instructions executed by hardware	Instructions interpreted by micro-programming
7	Fixed format instructions	Variable format instructions
8	Few instructions and modes	Large instructions and modes

Ex: Apple iPods (custom ARM^vTDMI SoC) Ex: System/360 (excluding the 'scientific' Model 44)
 Apple iPhone (Samsung ARM^vV^vJZF) PDP-11

4. Discuss in briefly, the types of ROM.

Types of ROM

- **Programmable ROM (PROM)**

It is non-volatile and may be written into only once.

- **Erasable Programmable ROM (EPROM)**

It is read and written electrically. all the storage cells must be erased to the same initial state by exposure of the packaged chip to ultraviolet radiation (UV ray). **EPROM** is optically managed and more expensive than PROM, but it has the advantage of the multiple update capability.

- **Electrically Erasable programmable ROM (EEPROM)**

This is a read mostly memory that can be written into at any time without erasing prior contents, only the byte or byte addresses are updated. The write operation takes considerably longer than the read operation, on the order of several hundred microseconds per byte. **EEPROM** is more expensive than **EPROM** and is less dense, supporting fewer bits per chip.

- **Flash Memory**

Flash memory is also the semiconductor memory and because of the speed with which it can be reprogrammed, it is termed as flash. It is interpreted between **EPROM** and **EEPROM** in both cost and functionality. Like EEPROM, flash memory uses an electrical erasing technology.

°- Define pipeline

- **Pipelining is a particularly effective way of organizing concurrent activity in a computer system.**
- **In computer architecture Pipelining means executing machine instructions concurrently.**
- **The pipelining is used in modern computers to achieve high performance.**
- **The speed of execution of programs is influenced by many factors to improve performance:**

* Use faster circuit technology to build the processor and the main memory.

* To arrange the hardware so that more than one operation can be performed at the same time.

Q2) Choose the correct answer: [20 points]

Fulfill: b6, C17

- 1- Registers contain data and instructions needed by the CPU.
a. True b. False
- 2- The fetch-decode-execute cycle refers to the process by which data is read from the hard drive and stored in memory.
a. True b. False
- 3- During the execution of a program which gets initialized first?
a. MDR b. IR c. PC d. MAR
- 4- When we perform subtraction on $-N$ and $-O$ the answer in N 's complement form is _____.
a. 1111 b. 1110 c. 1010 d. 0010
- 5- When an instruction is read from the memory, it is called _____.
a. Memory Read cycle. c. Fetch cycle.
b. Instruction cycle. d. Memory write cycle.

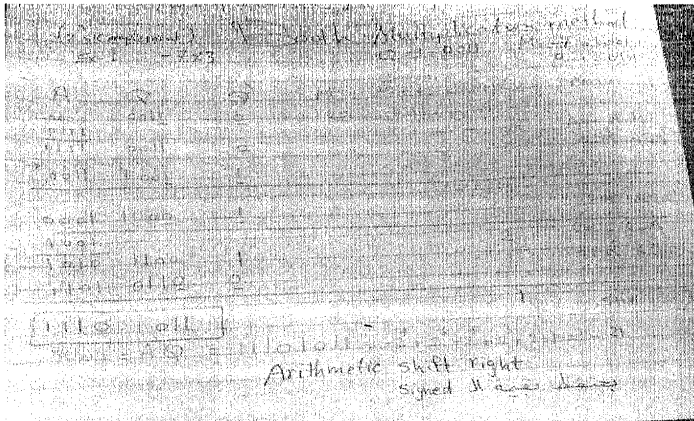
Q3- Answer by explanations the following questions [30 points]

1- Multiply given signed N 's complement numbers

$A = 1001$ multiplicand ($-N$) $B = 0011$ multiplier ($+N$)

Fulfill

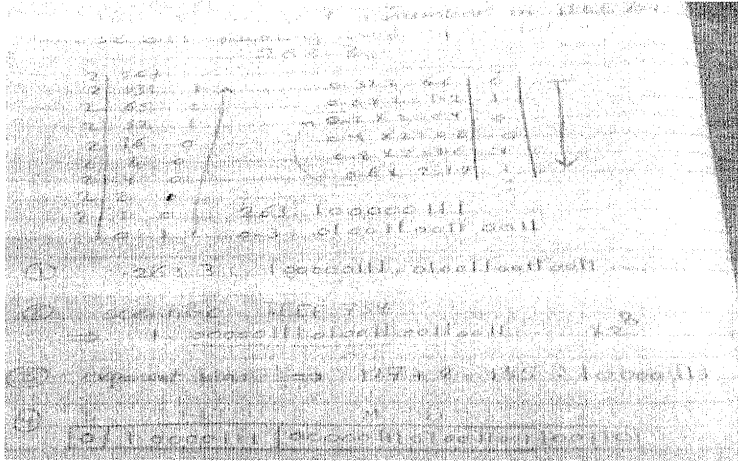
*a19, C3
b7*



2- Consider ϵ -bit dividend and γ -bit divisor:

Dividend = 1111 Divisor = 11

3- How to represent a number in IEEE γ bit floating point representation. (111.11)



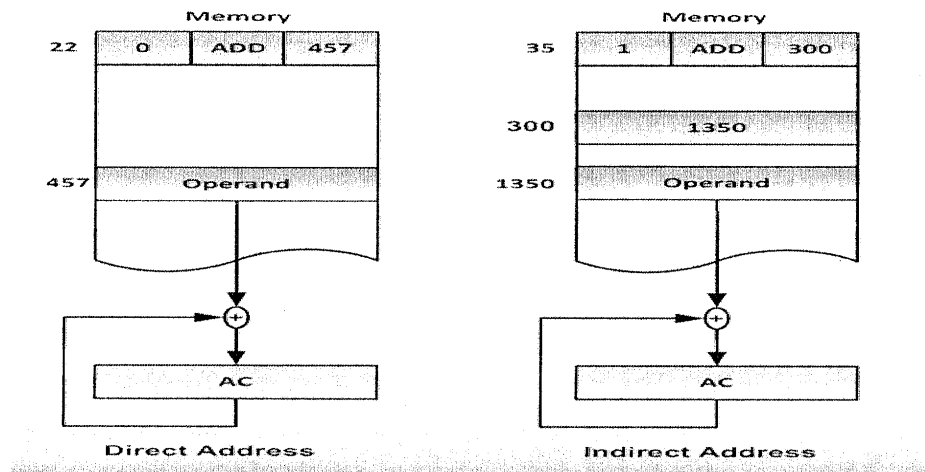
ε- What is the different kinds of addressing modes? With illustration by drawing

Direct Addressing:[slide ^]

In direct addressing mode, effective address of the operand is given in the address field of the instruction. It requires one memory reference to read the operand from the given location and provides only a limited address space. Length of the address field is usually less than the word length.

Indirect Addressing:

Indirect addressing mode, the address field of the instruction refers to the address of a word in memory, which in turn contains the full length address of the operand.



ο- What are the major functions of I/O system?

I/O interface provides a method for transferring binary information between internal storage, such as memory and CPU registers, and external I/O devices.