نموذج إجابة ورقة : نيو باك

1-Answer briefly on the following questions[25 points]

1. What in general terms, is the distinction between computer structure and computer function?

- Structure: is the way in which components relate to each other.
- Function: is the operation of individual components as part of the structure

2. What are the four main functions of a computer?

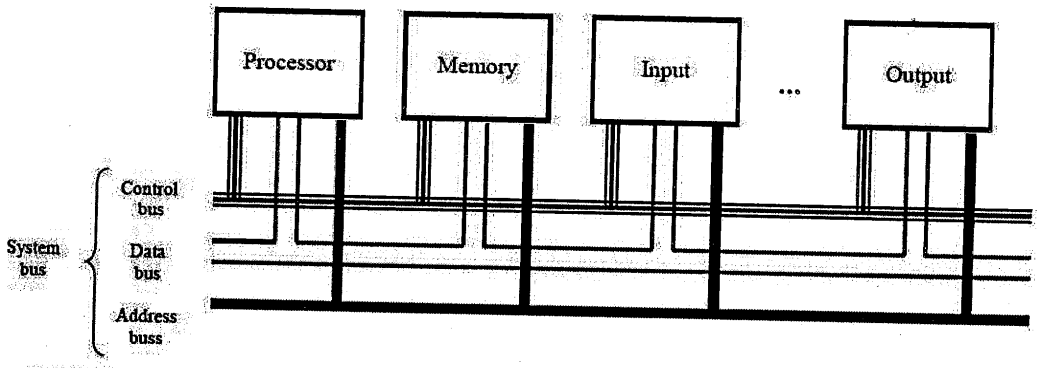
Data processing: Computer must be able to process data which may take a wide variety of forms and the range of processing.
Data storage: Computer stores data either temporarily or permanently.
Data movement: Computer must be able to move data between itself and the outside world.
Control: There must be a control of the above three functions.

3. In relation to computer architecture, what are buses?

(i)***Address bus:***Address bus is used to carry the address. It is unidirectional bus. The address is sent to from CPU to memory and I/O port and hence unidirectional. It consists of 16, 20, 24 or more parallel signal lines.

(ii)***Data bus:***Data bus is used to carry or transfer data to and from memory and I/O ports. They are bidirectional. The processor can read on data lines from memory and I/O port and as well as it can write data to memory. It consists of 8, 16, 32 or more parallel signal lines.

(iii)***Control bus:***Control bus is used to carry control signals in order to regulate the control activities. They are bidirectional. The CPU sends control signals on the control bus to enable the outputs of addressed memory devices or port devices.



Bus interconnection scheme

4. Discuss in briefly the types of RAM.

Static RAM (SRAM)

The static RAM consists of flip flop that stores binary information and this stored information remains valid as long as power is applied to the unit.

Dynamic RAM (DRAM)

- The dynamic RAM stores the binary information in the form of electrical charges and capacitor is used for this purpose.
- Since charge stored in capacitor discharges with time, capacitor must be periodically recharged and which is also called *refreshing memory.*

5- What is a pipeline hazard? What are their types? Discuss

Pipeline hazard: Any condition that causes the pipeline to stall is called hazard. They are also called as stalls or bubbles.

The types of pipeline hazards

The various pipeline hazards are:

(i) Data hazard, (ii) Structural Hazard, and (iii) Control Hazard.

Data hazard

Any condition in which either the source or the destination operand of an instruction are not available at the time expected in the pipeline is called data hazard.

Instruction or control hazard

The pipeline may be stalled because of a delay in the availability of an instruction. For example, this may be a result of a miss in the cache, requiring the instruction to be fetched from the main memory. Such hazards are often called control hazards or instruction hazard.

Structural hazards.

This is the situation when two instruction require the use of a given hardware resource at the same time. The most common case in which this hazard may arise is in access to memory.

6. What are the modes of I/O transfer data?

Programmed I/O

Interrupt Driven I/O

Direct Memory Access (DMA)

7- Describe the function of the following in the fetch-execute cycle.

- **Program counter**
- **The address bus**
- **The data bus**
- **The decoder**
- **The Arithmetic and Logic unit**

- Program counter:

This is a register in the CPU which contains the memory address of the next instruction to be processed.

- The address bus:

The memory address of the instruction to be fetched is transmitted from the program counter to the RAM through the address bus.

- The data bus:

The data is transmitted from RAM back to the instruction register in the CPU through the data bus.

- The decoder:

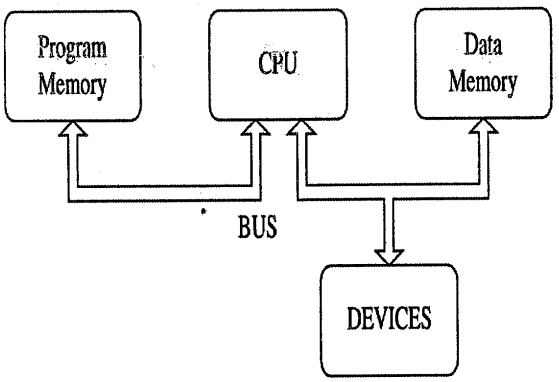
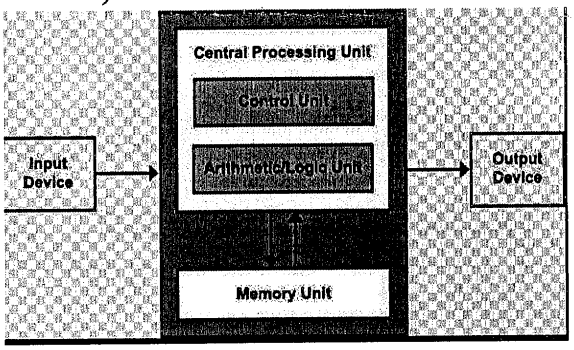
The decoder in the control unit works out what the instruction means – what has to be done to the data.

- The Arithmetic and Logic unit:

Perform mathematical operations such as addition, subtraction, multiplication and division. Additionally, the ALU processes basic logical operations like AND/OR calculations.

2- Discuss with illustration by drawing [5 points]

1- Distinguish between Von-Neumann Architecture and Harvard Architecture

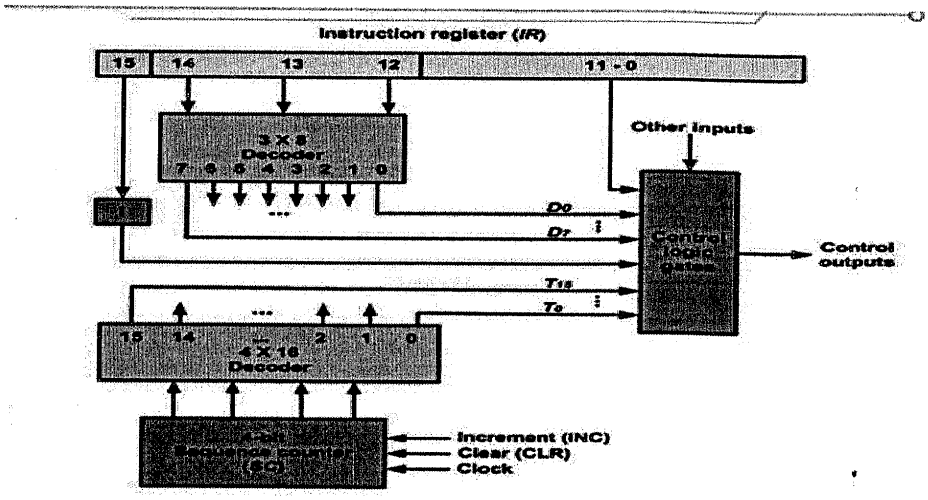
Harvard	Von-Neumann
- Two memories with two Buses allow parallel access to data access and instructions. - Control unit for two buses is more complicated and more expensive. - Program cannot write itself. - Both memories can use different sizes. - Development of a complicated Control Unit needs more time. - Free data memory can't be used for instruction and vice-versa. 	- 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. 

2- The components the Control unit of a basic computer.

Control unit of a basic computer [slide 18]

Consists of:

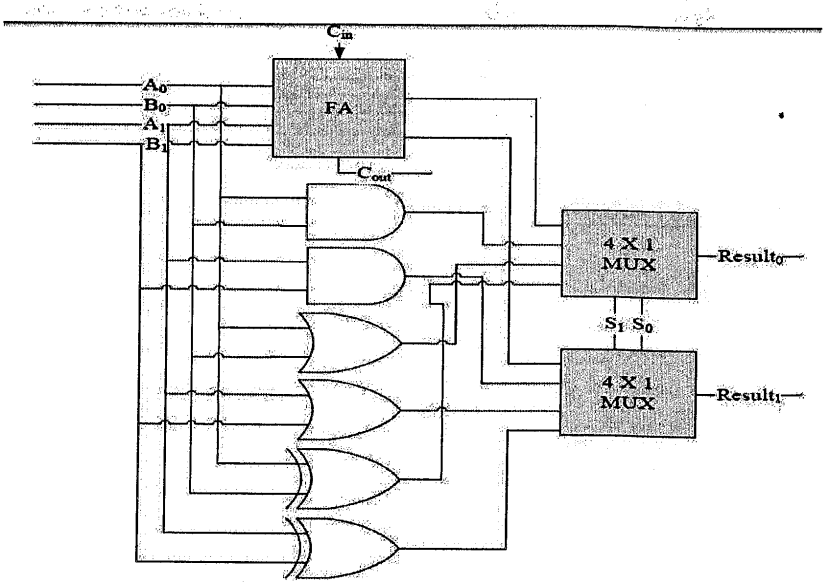
1- Opcode Decoder 3X8 [D0 – D7]
2- Timing Decoder 4X16 [T0 – T15]
3- 4-bit sequence counter
4- Control logic gates
5- IR register with 16-bit



3- Answer by explanations the following questions [25 points]

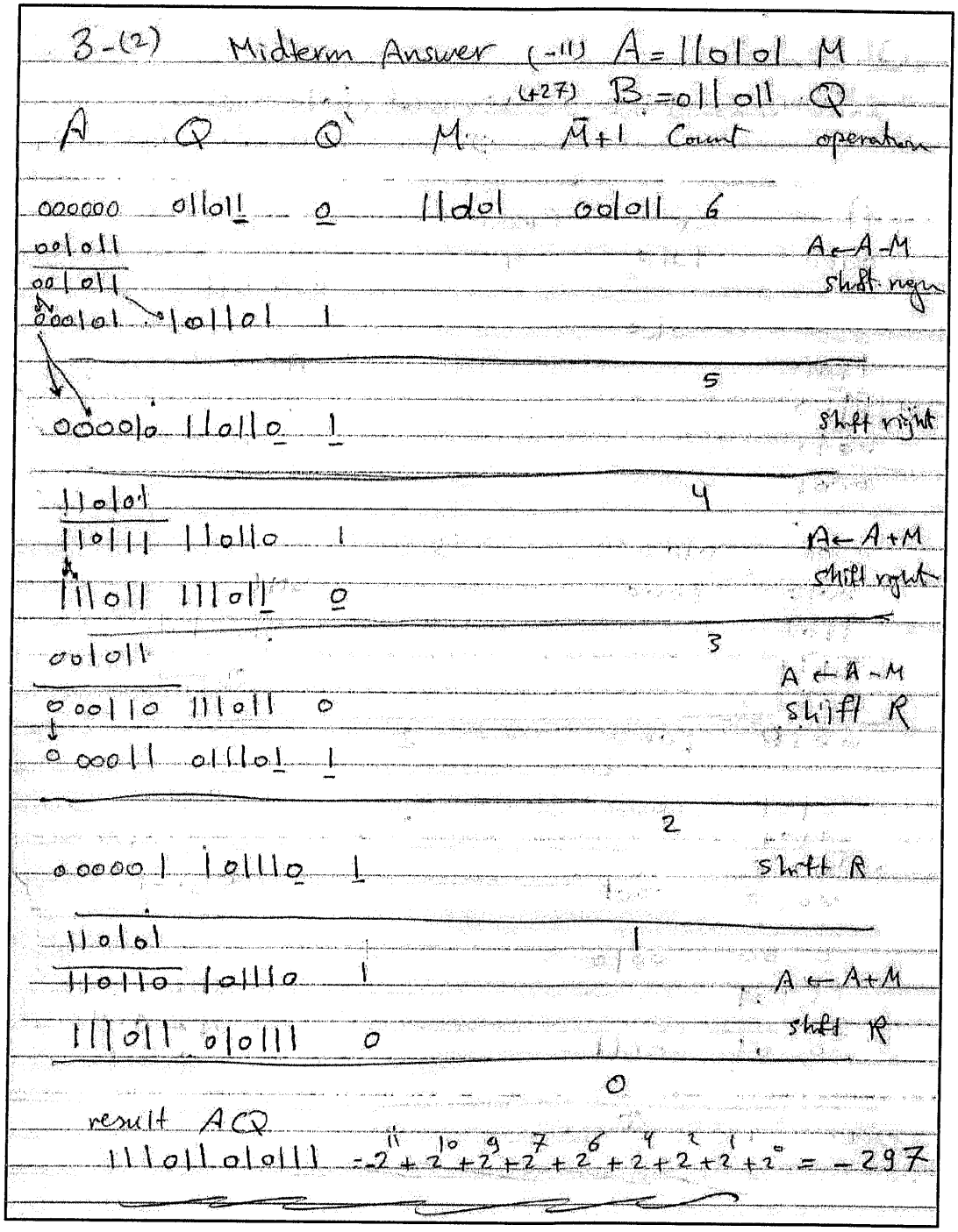
1- **Design a 2-bit binary ALU operations due to the following truth table of the control signals.**

S1	S2	operation
0	0	A OR B
0	1	A AND B
1	0	A XOR B
1	1	A + B



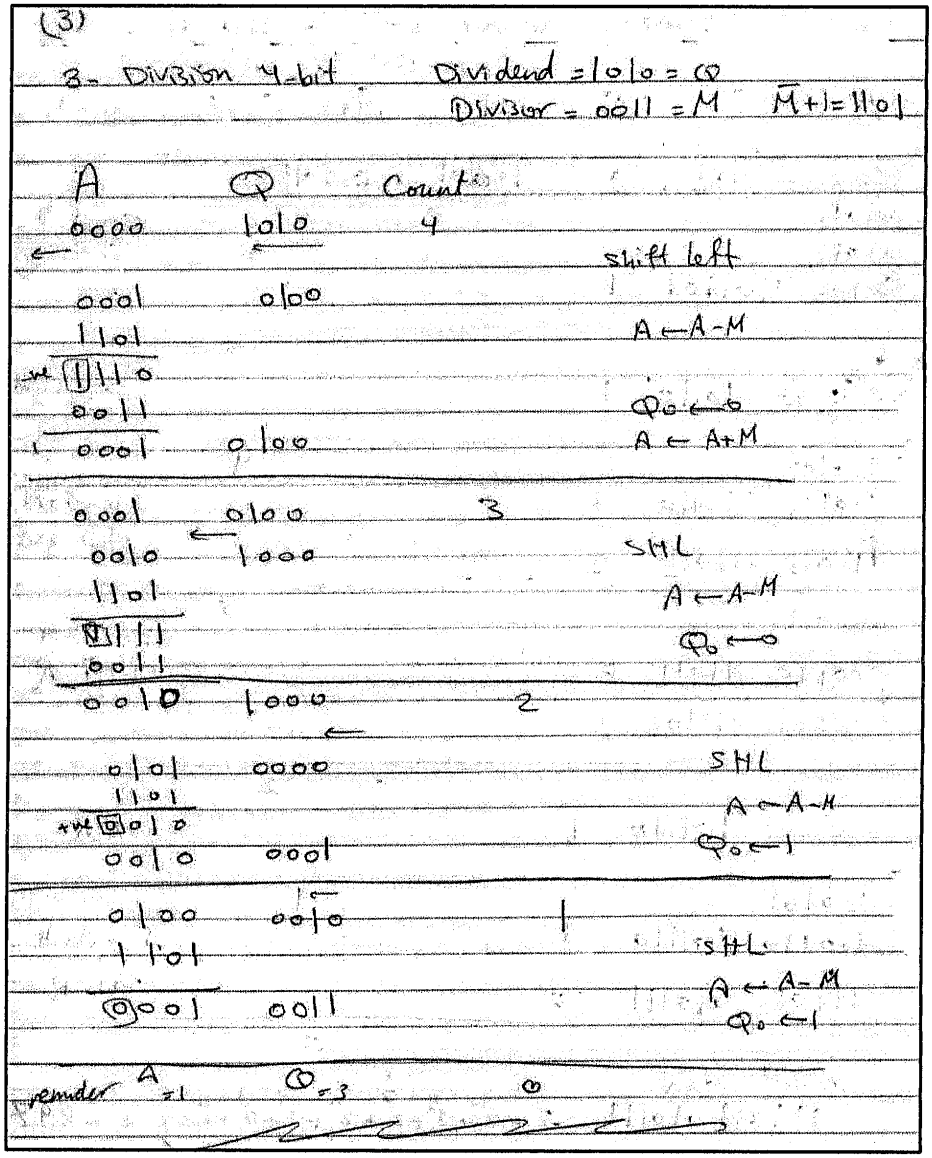
2- **Multiply given signed 2'S complement numbers**

A = 110101 multiplicand (-11) B = 011011 multiplier (+27)



3- Consider 4-bit dividend and 2-bit divisor:

Dividend = 1010 Divisor = 0011



4- Add single precision floating point numbers A and B, where
A= 44900000H and B= 42A00000H

3- Add in floating point.

(4) A = 44900000H B = 42A00000H

A = 0100 0100 1001 0000 0000 0000 0000 0000
B = 0100 0010 1010 0000 0000 0000 0000 0000

A	B
S = 0	S = 0
e = 10001001 = 137	e = 10000101 = 133
نرجع للأصل	نرجع للأصل
137 − 127 = 10	133 − 127 = 6
$A = 1.001000 \times 2^{10}$	$B = 1.01000 \times 2^{6}$
$= 10010.000 \times 2^{6}$	

Z = A + B

$$
\begin{array}{r}
10010.0000 \times 2^{6} \\
1.0100 \times 2^{6} \\
\hline
10011.0100 \times 2^{6}
\end{array}
$$

$= 1.00110100 \times 2^{10}$

Normalize

10 + 127 = 137 = 10001001

∴ Z = 0 1000 1001 0011 0100 0000 0000 0000 0000
449A0000 H

5- **Multiply (-18.25) by (9.5) using IEEE-754 32-bit floating-point format.**

3-(5)

Multiply (-18.25) by (9.5) using IEEE 754 32 bit

X = 9.5 Y = -18.25

1001.1000 = 10010.01

= 1.00111000 $\times 2^3$ = 1.00100101 $\times 2^4$

3 + 127 = 130 = 10000010 4 + 127 = 131 = 10000011

X = 0 10000010 00111000000000000000000

Y = 1 10000011 00100101000000000000000

Y = 1.00100101 $\times 2^4$

X = 1.0011 $\times 2^3$

1001.001 $\times 2^7$

10010.01

1001.001

10.1011011 $\times 2^7$

= 1.01011011 $\times 2^8$

8 + 127 = 135 = 10000111

Z = 1 10000111 01011011000000000000000

= -173.375