section - 1

① ⓐ

* **number system** :- A number system is a mathematical notation used to represent numbers.

number system are used daily in our life.

* type of number system.

→ **Decimal number system** :- is known as base 10 system is most widely used number syst.

* It is used ~~to~~ ten symbols (0 to 9) to represent number.

Ex :- 45687

→ **Binary number system** :- * is base 2 system
* uses only two symbols : 0 & 1
* It is widely used in computing & digital electronics.

Ex :- 0, 1

→ **Octal number system** :- is used base-8 system
* uses eight symbols : 0 - 7
* octal number are commonly used in computer Programming
* It represent's the power of 8

Ex :- $(643)_8$

→ Hexadecimal number system :- it consist of base 16
* uses 0 - 9 numbers & A - F Alphabets.
* where (A = 10, B = 11, ... F = 15)

Ex :- 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F

(b) convert the following:-

(i) $(671)_{10} = (\quad)_2$ = (Decimal to Binary)

→ 671 / 2

Ans = $(1010011111)_2$ → Reminders (Down to UP)

(ii) $(FD)_{16} = (\quad)_{10}$: (HexaDecimal to Decimal)

→ $(FD)_{16} = (15 \times 16^1) + (13 \times 16^0) = (253)_{10}$

Ans:- $(253)_{10}$

(c)(i) Find 1's complement of 1100001111_2

Ans :- ~~$\Rightarrow$~~ 1100001111_2 → should do reverse

1's → 0011110000_2

(ii) Find 2's complement of 11000100_2

Ans:- 11000100

1's → 00111011 +1

2's → 00111100

* Fist Find 1's compliment & then add (+1)

② (a) ~~List~~

→ logic gate :- is a electronic circuit which can take one or more input but output will be one.

* logic gate are made up of diodes & transistors
* A logic gate is used to allow & denied a digital ~~sy~~ signal.

Type of logic gate :- (1) AND gate, (2) OR gate, (3) NOT gate, (4) NAND gate (5) XOR gate, (6) XNOR gate (7) NOR gate

* AND gate :- In AND gate whose output is high 1 when both the input are 1.
if a single input is 0 the output ~~0~~ will be 0

AND gate equation :- $Y = A \cdot B$

Circuit Diagram :-

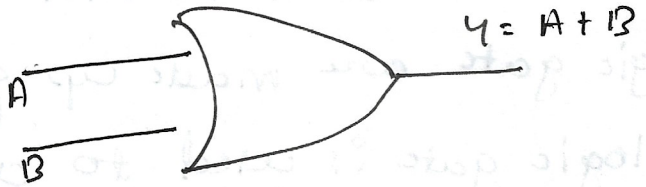
Truth table :-

A	B	Y = A · B
0	0	0
0	1	0
1	0	0
1	1	1

* OR gate :- This gate has two or more input & one output. If a single input 1 is high, the output 1 is obtained.

OR gate Equation :- $Y = A + B$

Circuit Digram :-



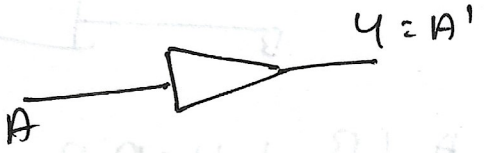
TT :-

A	B	Y = A + B
0	0	0
0	1	1
1	0	1
1	1	1

* NOT gate :- This is an inverting gate. It is also known as inverter.
* It converts high input 1 to low 0 & vice-versa.
* It has only one input & one output.
* output of gate is the opposite of the inpu

NOT Equ :- $Y = A'$

Circuit dig :-

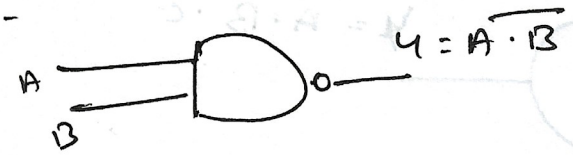


TT :-

A	Y = A'
0	1
1	0

* NAD Gate :- NOT + AND $(\overline{A \cdot B})$

Cir Diagram :-

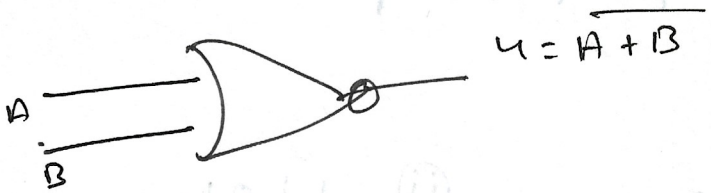


TT :-

A	B	$\overline{A \cdot B}$
0	0	1
0	1	1
1	0	1
1	1	0

* NOR : NOT + OR . $(\overline{A + B})$

cir digram

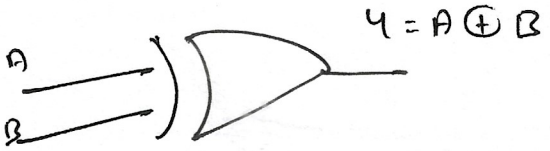


TT :-

A	B	$Y = \overline{A + B}$
0	0	1
0	1	0
1	0	0
1	1	0

* X-OR Gate :- $A \oplus B$

Cir Dig :-

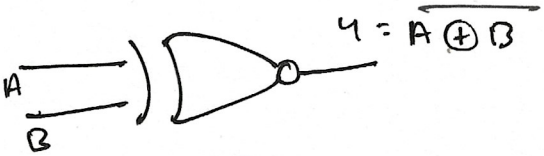


TT :-

A	B	$Y = A \oplus B$
0	0	0
0	1	1
1	0	1
1	1	0

* X-NOR Gate :- $\overline{A \oplus B}$

Cir Dig :-

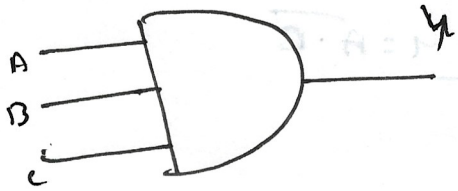


TT :-

A	B	$Y = \overline{A \oplus B}$
0	0	1
0	1	0
1	0	0
1	1	1

(b) TT for 3-input AND Gate.

Ans



$Y = A \cdot B \cdot C$

TT :-

A	B	C	Y
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

(c)

(i) $1100_2 * 1001_2$

(ii) $1101_2 + 1010_2$

Section – II

(3) a) Demorgan's theorem using TT (truth table).

→ statement (1) $\overline{A \cdot B} = \bar{A} + \bar{B}$

Proof of $\overline{A \cdot B} = \bar{A} + \bar{B}$ (should be same)

(TT)

A	B	A·B	$\overline{A \cdot B}$	$\bar{A}$	$\bar{B}$	$\bar{A} + \bar{B}$
0	0	0	1	1	1	1
0	1	0	1	1	0	1
1	0	0	1	0	1	1
1	1	1	0	0	0	0

According to the truth table we can verify that $\overline{A \cdot B} = \bar{A} + \bar{B}$

→ statment (2) $\overline{A + B} = \bar{A} \cdot \bar{B}$

Proof of $\overline{A + B} = \bar{A} \cdot \bar{B}$

(TT)

A	B	A+B	$\overline{A+B}$	$\bar{A}$	$\bar{B}$	$\overline{A \cdot B}$
0	0	0	1	1	1	1
0	1	1	0	1	0	0
1	0	1	0	0	1	0
1	1	1	0	0	0	0

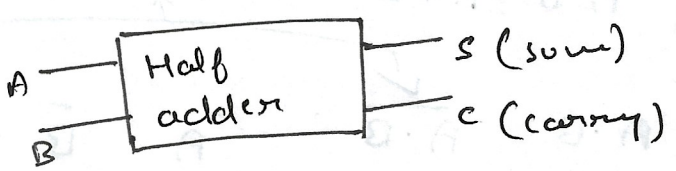
$\overline{A+B} = \bar{A} \cdot \bar{B}$ according to the truth table Theorem is verified.

(3b) Half adder

→ * Half adder is a combinational logic circuit designed to add Two ~~sig~~ single bit number.

* It contains two inpts & two outputs (sum & carry)

logic diagram :-



(1T)

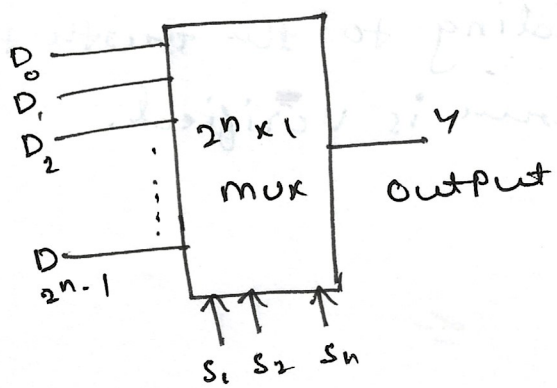
A	B	S	C
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

(3c) multiplexer & demultiplexor.

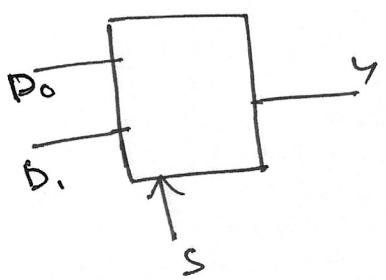
* multiplexer :- is a combinational logic circuit used to select only one input among several inputs based on selection lines.

** This can act as digital switch
* This is also called as data selector.
* For a mux there can be 2^n inputs
n selection lines & only one output.

Ex:-



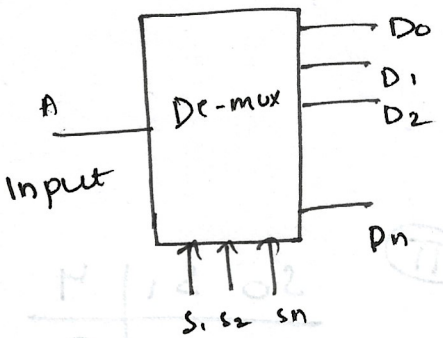
2 x 1 - mux



(3c) Demultiplexor :-

* Demultiplexor is also known as DEMux
* in DEmux Device takes a single input
* use select lines to determine the output line to receive the input signal.
* can be represented using a truth table or logic diag
* the numbers of select lines determines the number of output lines it can handle.
* De-mux address decoding, & signal routing application

Ex :-



(3d) ASCII

→ (c) 65 = A 90 = Z

(s) 97 = a 122 = z

(4a)

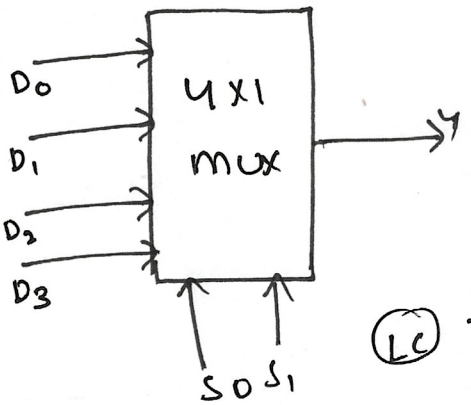
Flip Flop :- A FF is a sequential circuit It is a Binary storage divice capaded of storing at a time (1-bit of information)

* It as two stable and can be used to stor the state of information.
* It is also called as fundamentaal bilding block digital eclectronic system

type of Flip Flop :-

(1) SR or RS (3) Dila
(2) JK (4) Togal

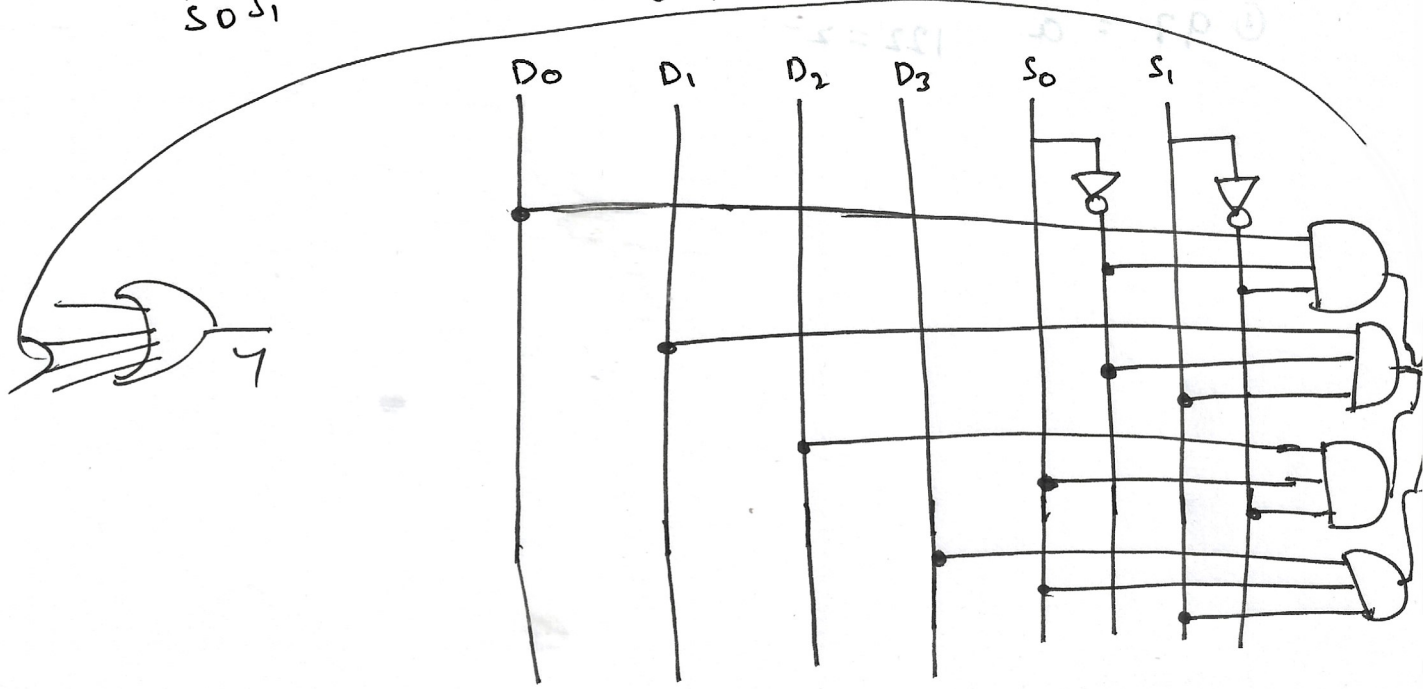
(4b) 4:1 mux (LG) (TT)



(TT)

S_0	S_1	Y
0	0	D_0
0	1	D_1
1	0	D_2
1	1	D_3

(LC) $Y = D_0 \bar{S}_0 \bar{S}_1 + D_1 \bar{S}_0 S_1 + D_2 S_0 \bar{S}_1 + D_3 S_0 S_1$



(6)

(4c)

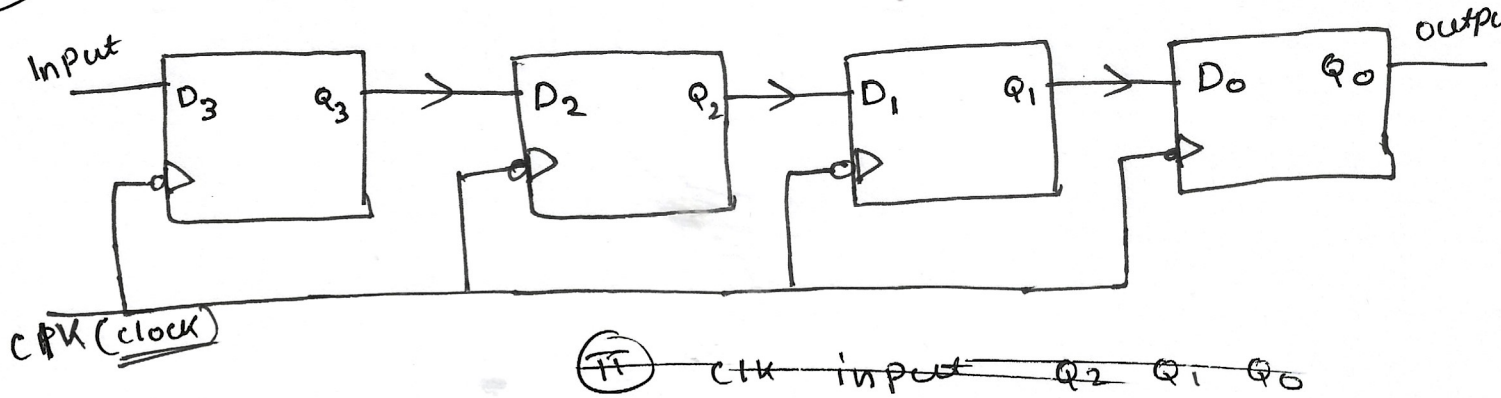
combinational circuit	Sequential circuit
→ * Time independent *	* Time dependent *
* depend upon present input to generate output.	* output depend upon present as well as previous input
* speed is fast	* speed is low
* Designed easy	* designed tough
* used for arithmatic as well as boolean operation	* used for elementary building blocks like FlipFlops.

(4) (d)

Section - IV

(5a) encoder :- is a digital circuit that convert information from one format to another in particular Particular, a decimal to BCD encoder is a specific type of encoder that takes a decimal input & convert it into the corresponding BCD code.

(5c)



(11) clk input Q2 Q1 Q0

6(a) computer Network :- is a group of computers which are connected to each - other for the purpose of sharing their resources is called computer network.

(1) ~~RAN~~ ← (1) LAN :- Stands for Local area network that spans a relatively small geographic area, typically within a single building (office, campus.)

(2) WAN :- Stands for wide area Network that extends over larg geographic area within (multiple cities, countries, or even continents)

(3) MAN :- Stands for metropolitan Area Network that cove a larger geographic area than a LAN but small than WAN within the city or metropolitan - region., connecting multipal LAN & outh Network.

(4) WLAN :- Stands for wireless Area Network type LAN that use wireless communication, instead of wired connection. It allow's devices to connect to the network without cables. such as (wifi)

(5) VPN :- Virtual private Network that Provide secure communication over Public network

6d)

* single user data Processing: involves a system or application that is designed to be used by a single individual at a time.
The system is typically installed on a PC or a standalone device

* multi-user Data Processing: involves a smart or application that allows multiple user to access & use the system simultaneously.

* Real-Time Data processing: involves systems that process data in real-time enabling immediate response & decision-making based on incoming data. ∴ processing can be both single-multi use

Section - IV

(7a) (i) First Gen :- It was used in the year (1940s-1950s)

* Vacuum Tube technology :- FG used vacuum tubes for electronic circuitry & switches.
* large size : taking up entire rooms and requiring extensive cooling system.
* limited programmability :- using machine learning & assembly language.

Ex :- ENIAC, UNIVAC, IBM701,

(2) second Gen :- They are Transistor technology replaced vacuum tubes. making computer smaller & faster.

* Batch Processing :- computers used batch processing where group of similar tasks were Processed together.
* The second Gen computer are magnetic core memory.

(3) Third Gen :- * Integrated circuits were developed combining multiple transistors on a single chip.
* computer became smaller, more powerful, & more affordable
* multiple users could access a single computer

④ Fourth Gen :- they are microprocessors brought computing power to individual desktop computer.

* PC became widely available, leading to a revolution in home office computing
* It has GUI with icon & windows made computers more user-friendly.

⑤ Fifth Gen :- The focus shifted to AI natural languag Processing & expert system.

* computer were designed with Parallel Processing
* The rise of laptop, smartphone, & tablets.

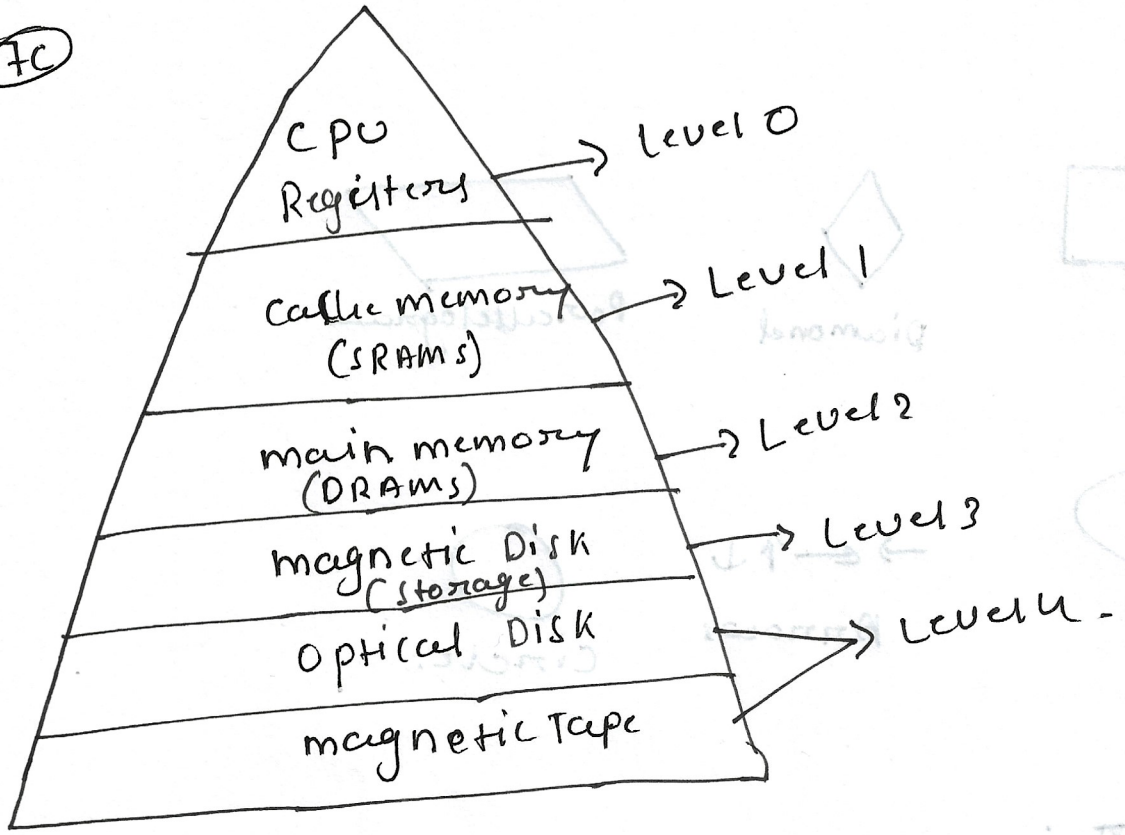
⑦⑥ multitasking OS

* The CPU time is divided into small time slices & each task is allocated a slice of time to execute its instructions
* The OS rapidly switch between different task, providing each task with a fair share of CPU time
* The instructions of different task are interleaved & executed in a time-sharing manner.
* ~~Com~~ multitasking can be either cooperative multitas-king

multiprocessing OS

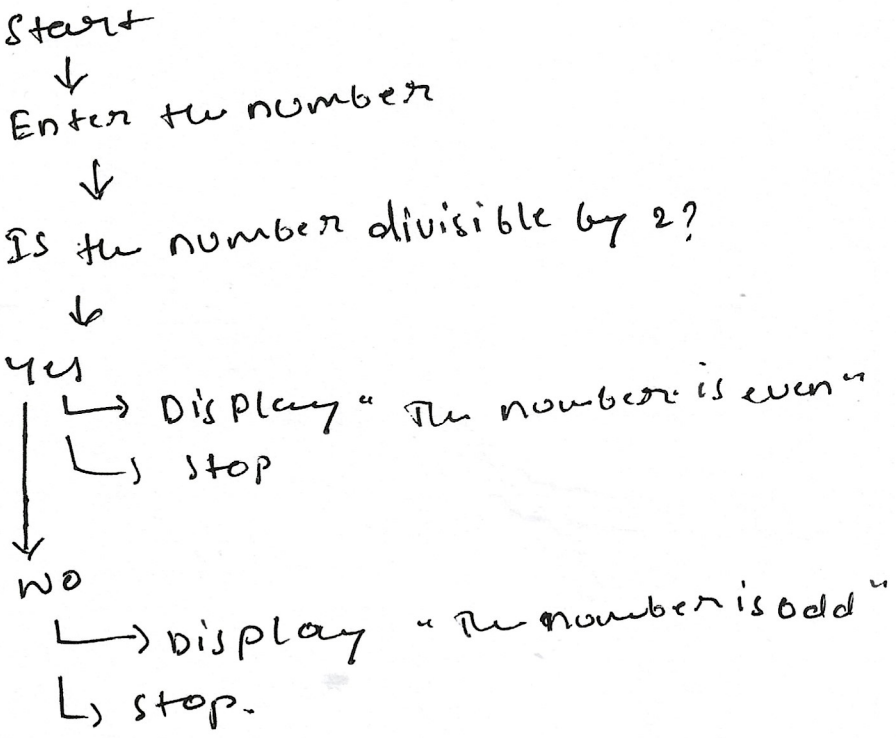
* multiple task or processes are executed in parallel across multiple CPUs or processors.
* multiprocessing system can scal with the addition of more processors.
* The OS provided mechanisms for inter-processor communication & coordination to synchron-ize & share data between the different processors.
* multiprocessing required the presence of multiple CPUs or processor core in the computer system.

7c

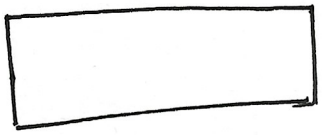


Section - V

9c

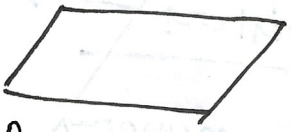


(10) a)

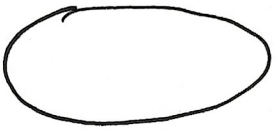


Rectangle

Diamond



Parallelogram



Oval

Arrows

Circle.

(10 b) ~~find in~~ .

8. a) Explain various functional units of computer with neat diagram.

→ Input Unit:

- The input unit is responsible for accepting input from various input devices such as keyboards, mice, scanners, and sensors.

Central Processing Unit (CPU):

- The CPU is the brain of the computer system.
- It performs the actual processing of data and instructions.

Memory Unit:

- The memory unit stores data and instructions that are currently being used by the CPU.
- It consists of two types of memory:

a) Primary Memory (RAM): It provides temporary storage for data and instructions that the CPU actively works on. RAM is volatile, meaning its contents are lost when power is turned off.

b) Secondary Memory: It provides long-term storage for data and instructions, even when the power is turned off. Examples include hard disk drives (HDDs) and solid-state drives (SSDs).

Control Unit (CU):

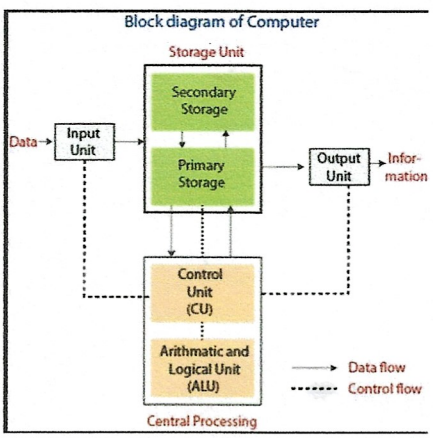
- The control unit manages and coordinates the operations of the CPU and other functional units.

Arithmetic Logic Unit (ALU):

- The ALU performs arithmetic (addition, subtraction, multiplication, division) and logical (AND, OR, NOT) operations on data.

Output Unit:

- The output unit is responsible for presenting processed data to the user or other output devices.
- It converts the internal representation of data into a format suitable for output devices such as monitors, printers, and speakers.



8. c) Differentiate between BIOS & UEFI.

BIOS	UEFI
BIOS is the older firmware interface that has been used for many years in traditional PCs	UEFI is the modern replacement for BIOS. It was introduced in the early 2000s as an enhanced and more advanced firmware interface.
The BIOS firmware starts the computer and performs a Power-On Self-Test (POST) to check hardware integrity.	UEFI has a more flexible and modular boot process
The BIOS interface is text-based and limited in terms of user interaction and configuration options	UEFI provides a graphical user interface (GUI) that allows users to interact with the firmware settings using a mouse and keyboard
BIOS firmware has limitations when it comes to hardware support	UEFI firmware provides better hardware support, including support for larger hard drives with GUID Partition Table (GPT), support for newer CPUs and devices, and improved compatibility with advanced technologies such as USB 3.0 and NVMe storage devices.
BIOS has limited security features	UEFI firmware includes built-in security features such as Secure Boot, which verifies the authenticity of the bootloader and operating system, protecting against rootkits and other malicious software.

9. d)

1. Start
2. Prompt the user to enter the input
3. Read the input
4. Initialize a variable, isCharacter, to false
5. Initialize a variable, isNumber, to false
6. Check if the length of the input is equal to 1
    a. If true, go to step 7
    b. If false, go to step 12
7. Check if the ASCII value of the input lies between 65 and 90 (uppercase letters)
    a. If true, set isCharacter to true
    b. If false, go to step 8
8. Check if the ASCII value of the input lies between 97 and 122 (lowercase letters)
    a. If true, set isCharacter to true
    b. If false, go to step 9
9. Check if the input is a digit (0-9)
    a. If true, set isNumber to true
    b. If false, go to step 10
10. Check if isCharacter is true and isNumber is false
    a. If true, display "The entered input is a character"
    b. If false, go to step 11
11. Check if isCharacter is false and isNumber is true
    a. If true, display "The entered input is a number"
    b. If false, go to step 12
12. Display "The entered input is neither a character nor a number"
13. End