1. List & briefly define the main structural components of a single processor computer.

Ans - Central processing unit (CPU)

brain of the computer, responsible for executing instructions, performing arithmatic & logical operations, & controlling the overall operation of the system.

- Memory

RAM (Random Access Memory) → temporary storage of data & instructions which the processor needs fast for processing.

ROM (Read - only - memory) → permanent storage of data & instrutions which can only be accessed but can't be messed up with, even after power is off

- Input / output devices (I/O device) -

the devices like keyboard, mouse, scanner etc used to feed data to the computer is known as input devices

the devices like monitor, speaker, printer etc used to get the output of the processed data is known as output devices.

- Storage devices

Hard disk drive, SSDs, are used to store data & programs even when the computer is powered off

- Motherboard

main circuit board of the computer.

- Bus system

pathways to allow data & instruction to be transferred to the CPU

2. Differentiate between

(i)

Microprocessor	Microcontroller
a) CPU that integrates the function of a computer's CPU in a IC chip	a) A complete computer system on a single chip.
b) typically requires external device to work fully functionally	b) All required systems are embedded by default on the chip.

(ii)

computer Organisation	computer Architecture
a) refers to the operational units & their interconnectio that relise the architectural specificatio	a) refers to the design attributes that affect the logical structure & operation of a computer system.
b) deals with physical components	b) deals with design principles & techniques used to define the organisation.

(iii)

Embedded system.	Deeply Embedded system
a) is a computing devices designed to perform specific dedicated functions within a larger mechanical or electrical system	a) refers to specialised type of embedded system that is tightly integrated into a larger system & operates under strict resource constraints
b) found in consumer electrical appliances	b) found within sensors, actuators.

3. List explain the cloud computing services.

<u>Ans</u> The 3 types of cloud computing ~~sy~~ services

→ SAAS → provides services to customers in the form of software, specifically app, running on & accessible in the cloud.

→ PAAS → provides services to customers in the form of a platform on which the customers' application can run.

→ IAAS → the customer has access to the underlying cloud infrastructure. provides virtual machines & other abstracted hardware & software

4. Briefly explain the different techniques used to increase the microprocessor speed.

<u>Ans</u> The different techniques are

→ Higher clock frequencies
increasing the clock speed of the microprocessor allow it to perform more instructions per second.

→ Multiple Cores
integrating multiple processing cores onto a single microprocessor chip enables parallel processing of instructions.

→ Instruction Cores
breaks down the execution of instructions into multiple stages, allowing multiple instruction to be processed simultaneously.

5 consider two different machines with an instruction set of 100000 instruction, both of which have a clock rate of 400 MHz.

Ans Machine 1

$$CPI = \frac{(2\times0.5) + (3\times0.15) + (4\times0.15) + (2\times0.2)}{1}$$

$$= \frac{1 + 0.45 + 0.6 + 0.4}{1} = \underline{2.45}$$

$$\cancel{\text{MIPS}} = \cancel{\frac{400\times10^6}{2.45}} \times \cancel{\frac{1}{10^6}} = \cancel{163265}$$

$$MIPS = \frac{400}{2.45\times10^6} = \underline{0.000163}$$

$$T = I_c \times CPI \times \tau = \frac{100000 \times 2.45}{400\times10^6}$$

$$= \frac{100000 \times 2.45}{400 \times 1000000} = 0.0006125 \text{ secs}$$

$$= \underline{0.61 \text{ ms}}$$

Machine 2

$$CPI = \frac{(1\times0.65) + (4\times0.15) + (3\times0.1) + (2\times0.1)}{1}$$

$$= 0.65 + 0.6 + 0.3 + 0.2$$

$$= 1.75$$

$$MIPS = \frac{400}{1.75\times10^6} = \underline{0.000228}$$

$$T = \frac{100000 \times 1.75}{400\times10^6} = 0.0004375 \text{ secs}$$

$$= \underline{0.43 \text{ ms}}$$

6. A doctore in a hospital observes that on average 6 patients per hour arrive & there are typically 3 patients in the hospital. Determine the average of time each patient spends in the hospital?

Ans $L = 3 \quad \lambda = 6$

$$W = \frac{L}{\lambda} = \frac{3}{6} = \frac{1}{5} = 30 \text{mins}$$

7. Determine the fraction of the execution time involves code that is parallel to achieve an overall speedup 2.25. Assume 15 numbers of parallel processors.

Ans overall speed = 2.25

$$\text{speedup} = \frac{1}{(1-P) + \frac{P}{N}}$$

$$2.25 = \frac{1}{(1-P) + \frac{P}{15}}$$

$$2.25 = \frac{1}{\frac{15 - 15P + P}{15}}$$

$$2.25 = \frac{1}{\frac{15 - 14P}{15}}$$

$$2.25 = \frac{15}{15 - 14P}$$

$$15 - 14p = \frac{15}{2.25}$$

$$15 - 14p = 6.75$$

$$15 - 6.75 = 14p$$

$$\frac{8.25}{14} = P$$

$$p = 0.588$$

8.

	Computer A	Computer B	Computer C
Program 1	50	20	10
Program 2	100	200	40

Ans

	computer A	computer B	computer C
program 1	0.2	0.5	1.0
Program 2	0.1	0.05	0.25
A.M	0.15 (3rd)	0.275 (2nd)	0.625 (1st)
H.M	0.133 (2nd)	0.09 (3rd)	0.4 (1st)

9. Let a program has 40% of its code enhanced to run 2.3 times faster. Determine the overall speedup of the system.

Ans $S_{overall} = \dfrac{1}{(1-P) + \frac{P}{S}} = \dfrac{1}{(1-0.4) + \frac{0.4}{2.3}}$

$= \dfrac{1}{0.6 + \frac{0.4}{2.3}}$

$= \dfrac{1}{0.6 + 0.1739}$

$= \dfrac{1}{0.7739}$

≈ 1.2913

[$S_{overall} \approx 1.2913$ times faster]

10- Explain different addressing modes of 8086 micro processor with suitable examples.

Ans Different addressing modes are as follows:-

→ Immediate addressing mode:

Operand is specified directly in the instruction itself

eg:- MOV AX, 1234H (1234H is stored in AX register)

→ Register Addressing mode:

The operand is specified directly by one of the micro processors registers

eg:- ADD AX, BX (contents of AX is added to the contents of BX)

→ Direct Addressing mode:

the operands memory address is directly specified in the instruction

eg:- MOV AX, [1234H] (the contents of the memory location 1234H are moved into the AX register)

→ Register indirect Addressing mode:

the operand's memory address is contained in a register.

eg:- MOV AX, [BX] (contents of the memory location whose address is stored in the BX register are moved into the AX register)

→ Indexed Addressing mode:

an index register is added to a base address to calculate the effective address of the operand.

eg:- MOV AX, [SI +10h] (contents of the memory loc whose address is SI+10h are moved into the AX register)

→ Base-Relative Addressing mode

& the operand's memory address is calculated by adding an offset to a base address stored in a register.

eg:- MOV AX, [BX+20h] (Contents of the memory location whose address is BX+20H are moved into the AX register)

11. Explain the register organisation of 8086 microprocessor with suitable examples.

Ans General purpose registers :-

→ 16 bits sized AX, BX, CX, DX - registers

eg:- MOV AX, [1667H]

ADD AX, BX

Index Registers :-

→ two index registers are source index (SI) & Destination index (DI)

eg:- MOV SI, OFFSET

Base & stack pointers :-

→ includes two important pointers : Base pointer (BP) & Stack pointer (SP)

eg:- MOV BP, 8000h

MOV SP, 8000h

Instruction pointer :-

→ includes the IP (instruction pointer) register, which stores the offset address of the next instruction to be executed

eg:- JMP label_name

Segment Registers

→ It has 4 registers i.e. Code segment (CS), Data segment (DS) stack segment (SS), extra segment (ES).

eg:-
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MOV AX, 1234H
MOV DS, AX
```

12 (a) Write an assembly language program to multiply 40H with 8H using logical instructions of 8086 microprocessor only.

```
MOV AL, 40H
MOV BL, 8H

MUL BL
```

(b) Code :- Determine the output & its memory location

MOV AX, 23F0H → 23F0H loaded in AX
MOV BX, AX → value of AX stored in BX
MOV [BX], AX → value of AX stored in the memory location inside BX
MOV CX, 503FH → 503FH in CX
MOV AX, CX → copy of CX is stored in AX
SUB AX, [BX] → Substract the value stored in the memory location whose add is saved in BX from AX
INC BX
INC BX } increment twice
MOV [BX], AX → Store the value of AX into the memory location whose address is contained in BX.
HLT → execution halted

The final value is (2F4Fh) ~~is stored~~
the value in AX (2F4Fh) is stored at the memory location pointed to by BX.