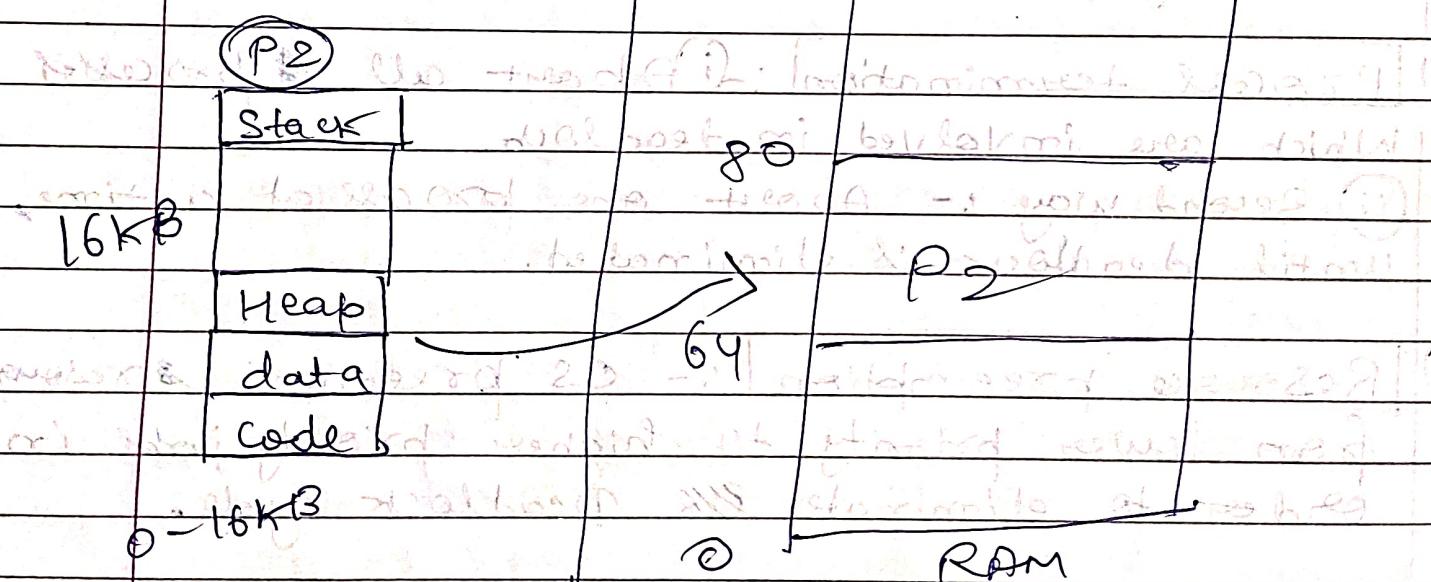
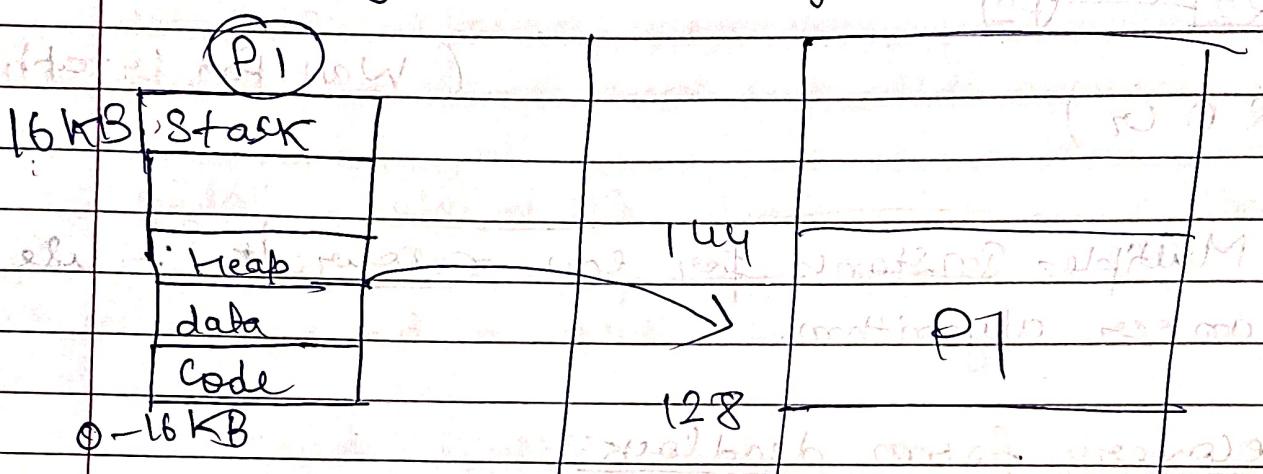


L:- 23

* Memory management Techniques | Contiguous Memory Allocation

• Why memory management?

In multi-programming environment, we have multiple processes in the main memory (Ready queue) to keep the CPU utilization high, to do this we have to share the main memory. As a result, we must have to manage main memory.



logical address

physical address

layer of abstraction

Fig. 1 (Memory Diagram)

(P₁) \rightarrow Base = 128, Offset = 16 (P₂) \rightarrow Base = 64, Offset = 16

• Logical Address

- i) An address generated by the CPU, it is an address of an instruction or data used by a process.
- ii) User can access only the logical address and indirect address to physical address via logical address.
- iii) Logical address does not exist physically, so it is a virtual address. Range: -1024 to 1536ax.

• Physical address

- i) An address loaded into the memory-address register of the physical memory (RAM).
- ii) The set of all physical address corresponding to the logical address is commonly known as Physical Address Space.
- iii) It is computed by Memory Management Unit (MMU). Range: (R+0) to (R+Max), R = Base value. MMU is a hardware device which do the runtime mapping from virtual to physical address.
- The user's program mainly generates the logical address.

- How OS manages the isolation and protection?

Ans ① OS provides the virtual Address Space (VAS) concept.

(i) **Relocation Register**:- Contains value of smallest physical address (Base address [R])

limit register :- Contains the range of logical address (16KB)

(ii) Each logical address must be less than the limit register.

(iii) When CPU & scheduler selects a process for execution, the dispatcher loads the relocation and limit registers with correct values.

Every address generated by the CPU is checked against these registers.

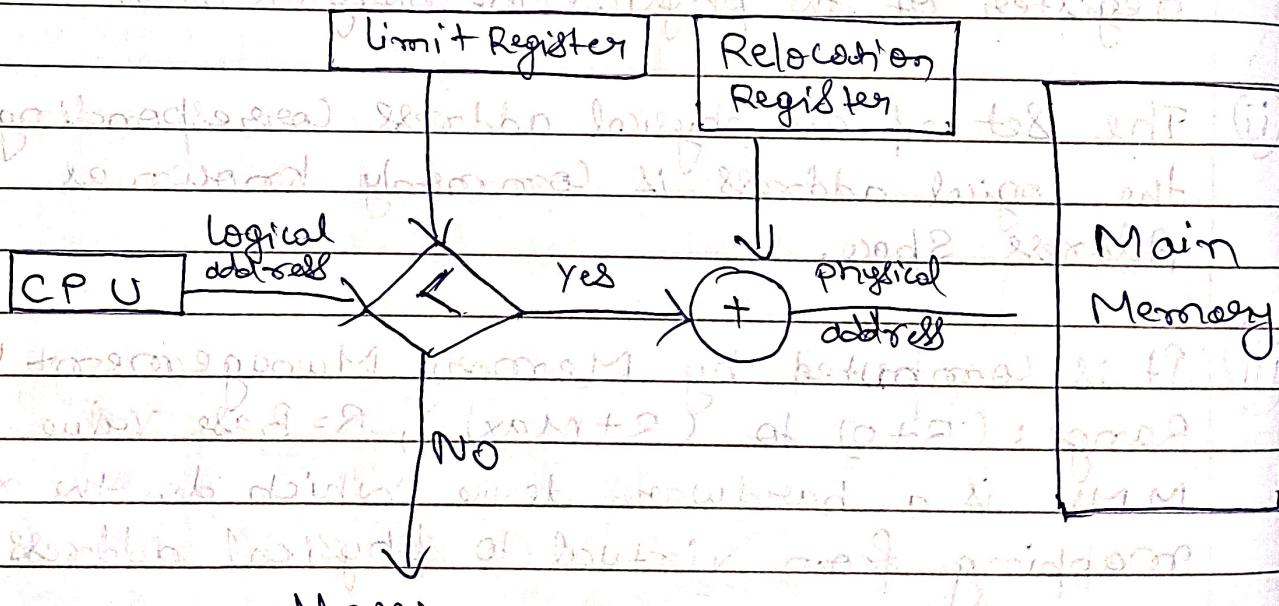
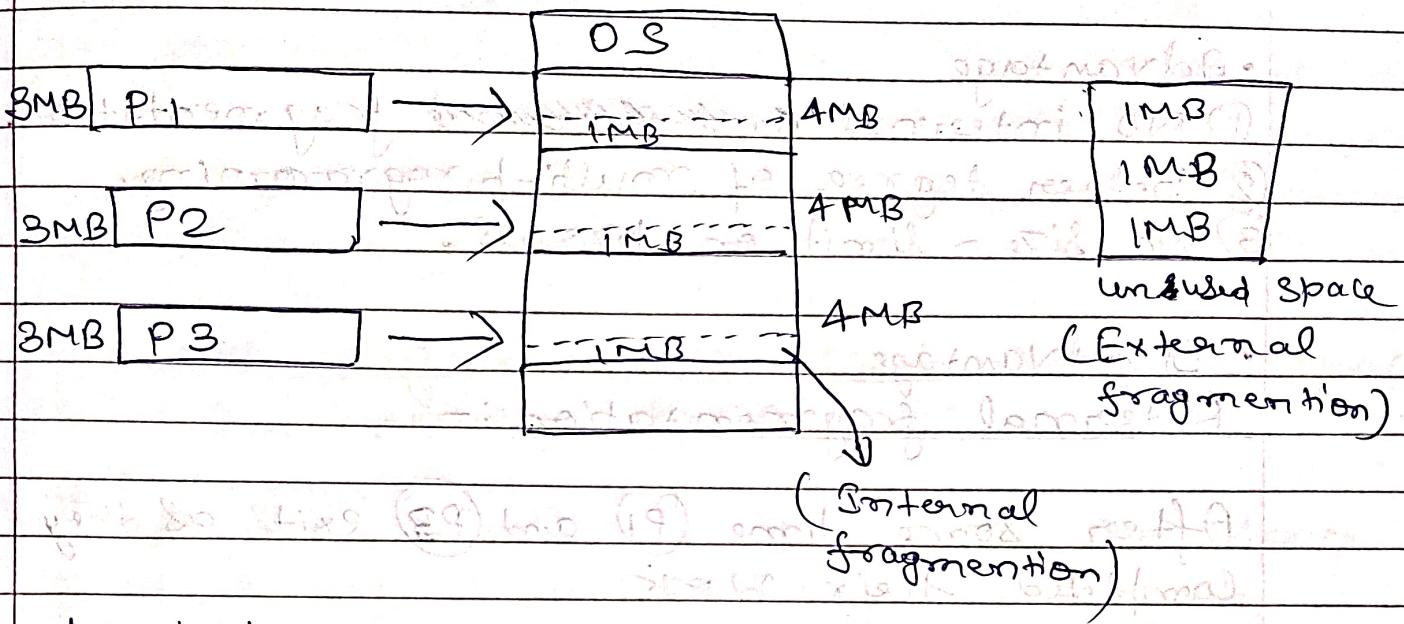


Fig 2. (CPU memory Addressing).

- Allocation method
- (a) Contiguous Allocation
- (b) Non-contiguous Allocation
- Contiguous Allocation
- (1) Fixed Partitioning :- The main memory is divided into partitions of equal or different sizes.



- Limitation :-

- ① Internal fragmentation :- If the size of the process is less than the total size of the partition then some space gets wasted.
- ② External fragmentation :- The total unused space of various partitions.
- ③ Limitation on process size :- We cannot load the process which size is more than the partition size.
- ④ Low degree of multi-programming :- the degree of multi-programming is equal to no. of partitions.

(2)

Dynamic Partitioning

Partitioning size is not declared initially, it is decided at the time of process loading.

		OS	
3 MB	P1	3 MB	Partition 1
3 MB	P2	3 MB	Partition 2
3 MB	P3	3 MB	Partition 3

- Advantage

- (1) NO internal fragmentation.
- (2) Better degree of multiprogramming.
- (3) NO size-limit on process.

- Disadvantage

External fragmentation :-

After some time (P_1) and (P_3) exits as they completed their work.

		OS	
		3 MB	
		3 MB	

Now a new process of 6 MB comes but it has to wait until (P_2) exit as the contiguous space of 6 MB is not available right now, so it is an external fragmentation issue.