Name - Atishay Jain
E.No. - 21103285
Batch - 68

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OSSP Tutorial-7

Q1 1. The logical address does not exist physically in the memory whereas physical address is a location in the memory that can be accessed physically.
2. The logical address is generated by the CPU whereas physical address is computed by Memory Management Unit (MMU).

Q2. The major advantage of this scheme is that it is an effective mechanism for code & data sharing. eg- only one copy of an editor or a compiler to be kept in memory. Another advantage is protection of code against erroneous modification. The only disadvantage is that the code & data must be separated.

Q3. Paging is implemented by breaking up an address into a page & offset number. It is most efficient to break the address into X page bits & Y offset bit, rather than perform arithmetic on the address to calculate the page no. & offset. Because each bit position represents a power of 2, splitting an address b/w bits results in a page size that is a power of 2.

Q4. By allowing two entries in a page table to point to the same page frame in memory, users can share code & data. "Copying" large amts of memory could be effected by having different page tables point to the same memory location.

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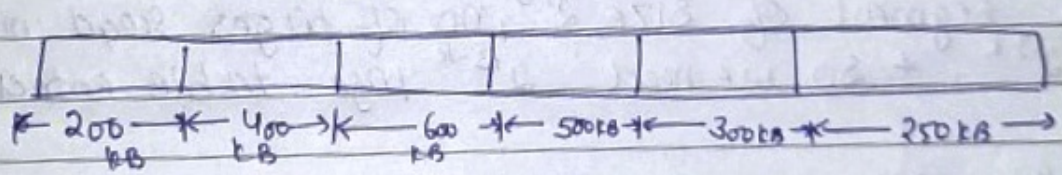
Q5. Since segment tables are a collection of base-limit registers, segments can be shared when entries in the segment table of two different jobs point to the same physical locat". The two segment tables must ~~have~~ be the same in the two processes.

Q6 Both these reduce to a program being able to reference both its own code & data without knowing the segment or page no. associated with the addrs. MULTICS solved this by associating 4 registers with each process. The idea is that all references have to be indirect through a register that maps to the current segment or page no.

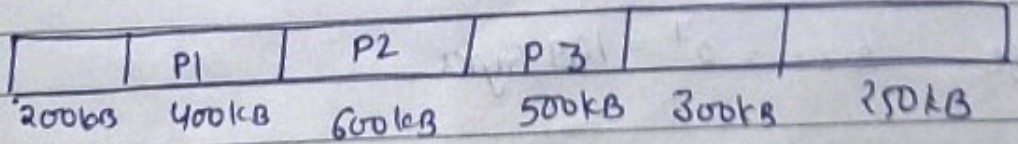
Q7.

Main Memory →



(a) P1 = 357 kB P2 = 210 kB P3 = 468 kB
P4 = 491kB

(a) First Fit →



P4 can't be allocated the memory because no partition size is greater or equal to P4.

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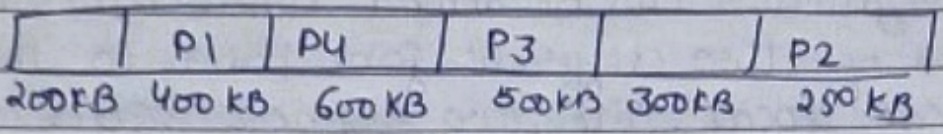
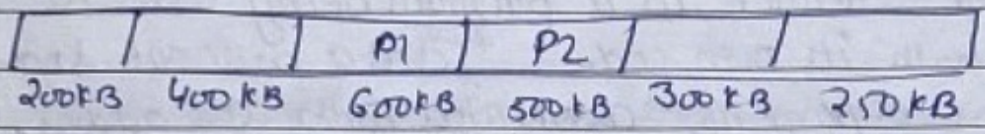
b) Best fit



c) Worst Fit



P3 & P4 can't be allocated memory.

Q8. Size of each segment $= \frac{2^{16}}{8} = 2^{13}$

Let the size of page be 2^k bytes.

For a segment of size 2^{13}, no. of pages reqd will be 2^{13-k} & so we need 2^{13-k} page table entries.

Now, the size of entries must be less than or equal to page size. So →

$2^{13-k} \times 2 = 2^k$ (Page table entry = 2 bytes)

⇒ $k = 7$ bits

So, page size $= 2^7 = 128$ bytes.

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Q9. No. of Pages for a segment = $\frac{2^{16}}{2^9} = 2^7$

Bits needed for page frame identification
= 7 bits
+ 1 valid bit
+ 3 page protection bits
+ 1 dirty bit
= 12 bits for a page table entry.

Size of each entry = 2 bytes = 16 bits.
No. of bits left for aging = 16 - 12 = 4 bits.