Operating systems

Sheet 8

(EED)

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1-Why is the capability to relocate processes -desirable?

Process relocation is desirable for perfect memory utilization, and it helps to have less fragmentations between processes, Process relocation also helps in process isolation.

2-What are the distinctions among logical, relative, and physical addresses?

- Logical Address:

  Logical addresses are generated by the CPU during the execution, and Each process has its own logical address space, which starts from address 0 and goes up to the maximum address allowed by the system.

- Relative Address:

  Relative addresses are offsets or distances from a known reference point and are often used to calculate the actual physical addresses.

- Physical Address:

  Physical addresses represent the actual location of data or instructions in the physical memory.

3-What is the difference between internal and external fragmentation?

Internal fragmentation occurs when allocated memory is larger than the size which is needed by the process.

External fragmentation occurs when memory has space required by process to allocate but divided into small, separated parts.

4-Consider a fixed partitioning scheme with equal-size partitions of 2^{16} bytes and a total main memory size of 2^{24} bytes. A process table is maintained that includes a pointer to a partition for each resident process. How many bits are required for the pointer?

$2^{24} \div 2^{16} = 256$

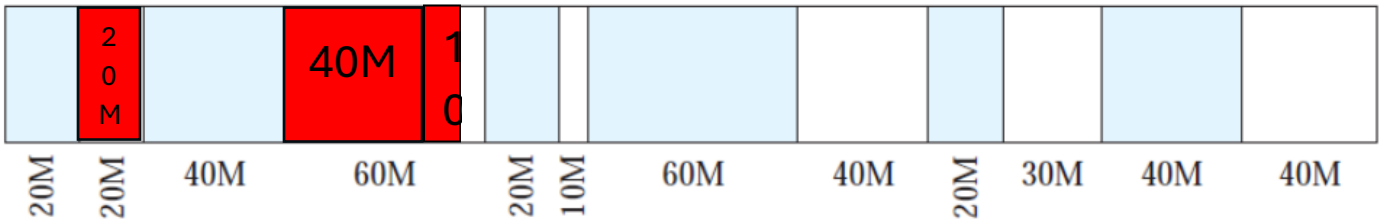
256 which is 2^8 so pointer need **8** bits.

5-Another placement algorithm for dynamic partitioning is referred to as worst-fit. In this case, the largest free block of memory is used for bringing in a process. Discuss the pros and cons of this method compared to first-, next-, and best-fit.

- Advantages
  Reduce external fragmentation.
- Disadvantages
  Increase internal fragmentation as large space is left without being used.
  Longer search than first and next fit same as best fit

6- A dynamic partitioning scheme is being used, and the following is the memory configuration at a given point in time: The shaded areas are allocated blocks; the white areas are free blocks. The next three memory requests are for 40M, 20M, and 10M. Indicate the starting address for each of the three blocks using the following placement algorithms:

a-first fit



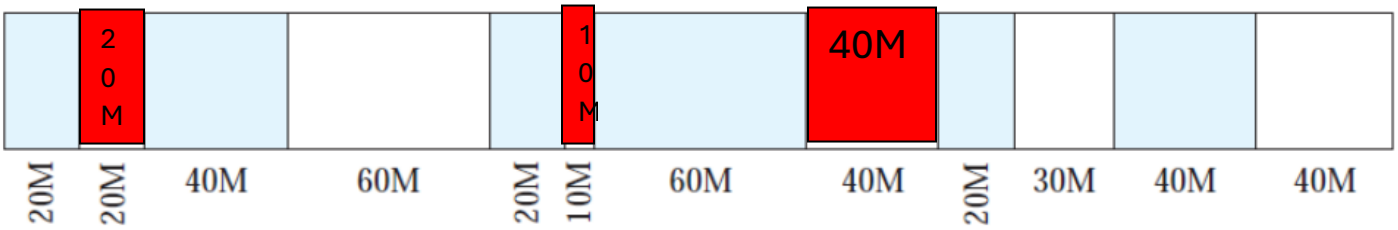
starting addresses

40M -> 80M

20M -> 20M

10M -> 120M

b-best fit



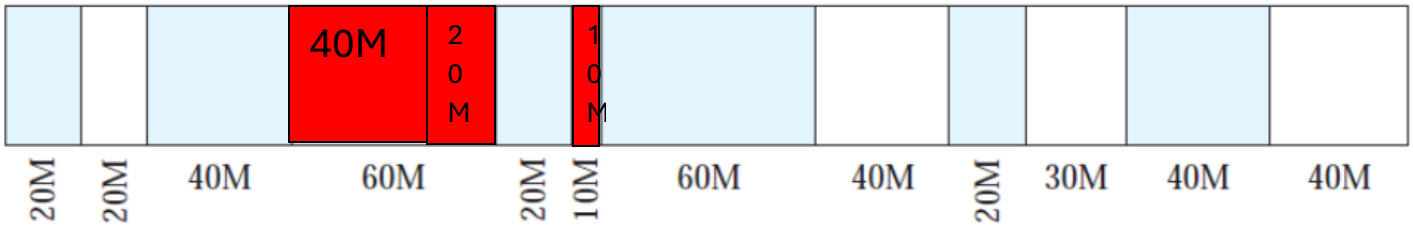
starting addresses

40M -> 230M

20M -> 20M

10M -> 160M

C-next fit



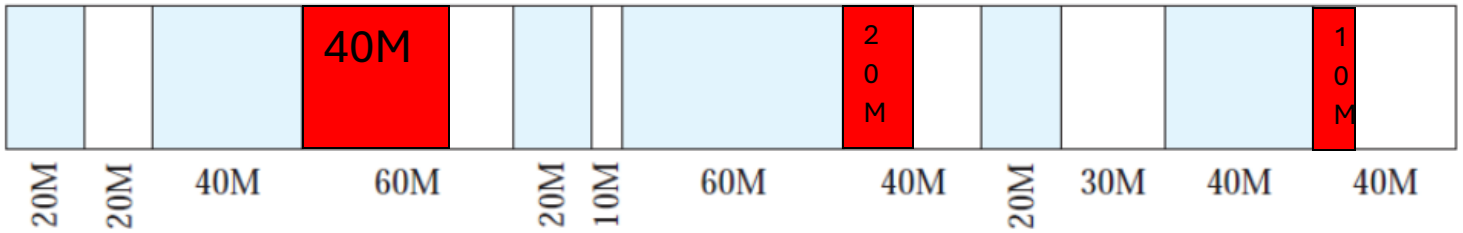
starting addresses

40M -> 80M

20M -> 120M

10M -> 140M

d-worst fit



starting addresses

40M -> 80M

20M -> 230M

10M -> 360M

7-

a- What was the maximum size of the swapped-out process?

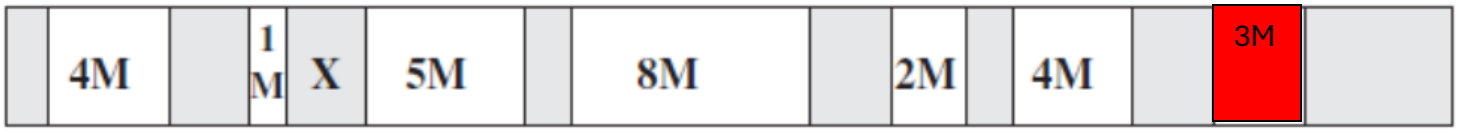
3 M-byte

b. What was the size of the free block just before it was partitioned by X?

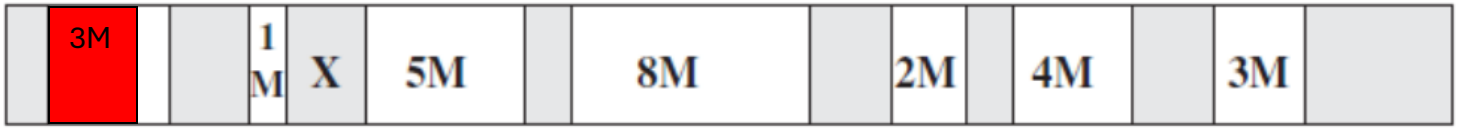
8 M-byte

c-A new 3-Mbyte allocation request must be satisfied next. Indicate the intervals of memory where a partition will be created for the new process under the following four placement algorithms: best-fit, first-fit, next-fit, and worst-fit. For each algorithm, draw a horizontal segment under the memory strip and label it clearly.

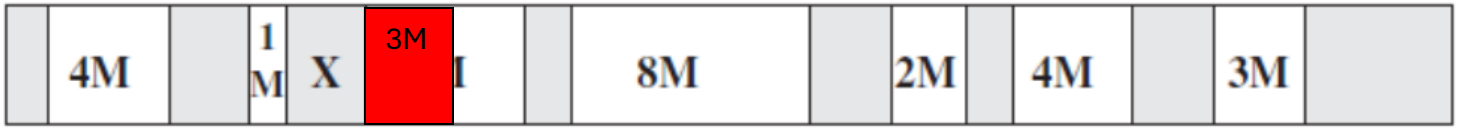
best-fit



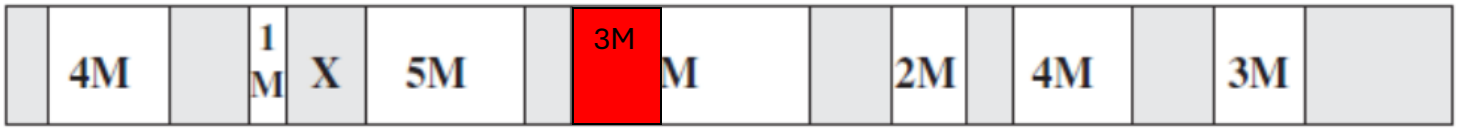
first -fit



next-fit



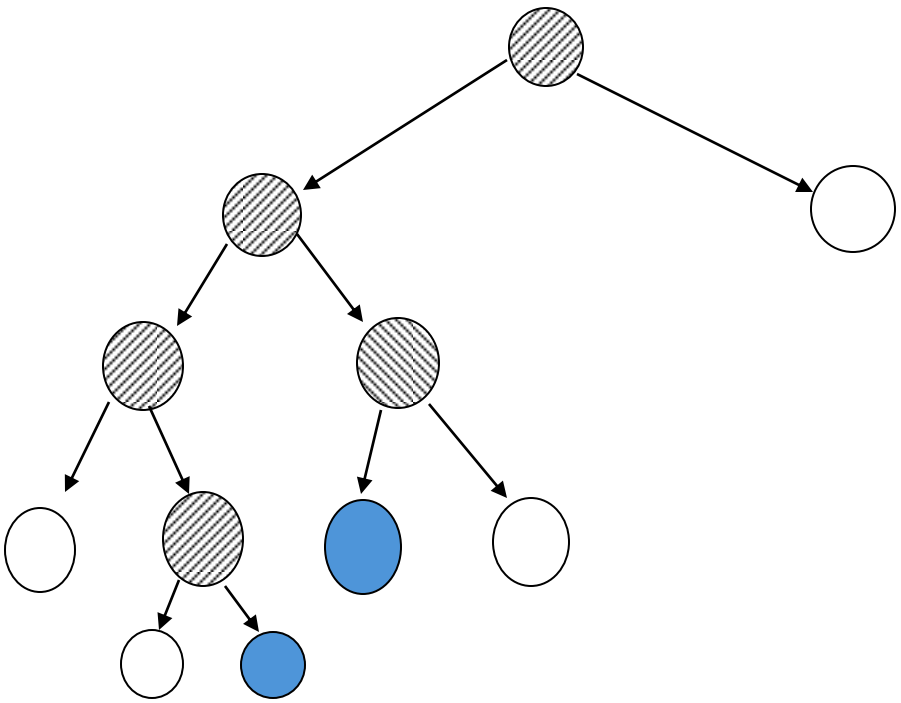
worst-fit



8) a-

Request (A) 70	A	128		256		512
Request (B) 35	A	B	64	256		512
Request (C)80	A	B	64	C	128	512
Return A	128	B	64	C	128	512
Request (D)60	128	B	D	C	128	512
Return B	128	64	D	C	128	512
Return D	256			C	128	512
Return C	1024					

b-



9-

a. If the block is of size 4, what is the binary address of its buddy?

011011110100

b. If the block is of size 16, what is the binary address of its buddy?

011011100000

10)

Consider a simple paging system with the following parameters: 2^{32} bytes of physical memory; page size of 2^{10} bytes; 2^{16} pages of logical address space.

a-How many bits are in a logical address?

Logical address=$2^{16}*2^{10} = 2^{26}$

Bits=26

b. How many bytes in a frame?

Bytes in a frame= 2^{10}

c. How many bits in the physical address specify the frame?

No of frames= $2^{32}/2^{10} = 2^{22}$

no of bits =22

d. How many entries in the page table?

Each page has one entry so entries =2^{16}

e. How many bits in each page table entry?

22 bits

11. A logical address a in a paging system is equivalent to a pair (p, w), in which p is a page number and w is a byte number within the page. Let z be the number of bytes in a page. Find algebraic equations that show p and w as functions of z and a.

The relationship is a = pz + w.

p = [a/z], the integer part of a/z.

w = Rz (a), the remainder obtained in dividing a by z

12) For each of the following logical addresses, determine the physical address or indicate if a segment fault occurs:

a-0, 198

660+198=858

b. 2, 156

222+156=378

c. 1, 530

segment 1 has only 422 segmentation fault.

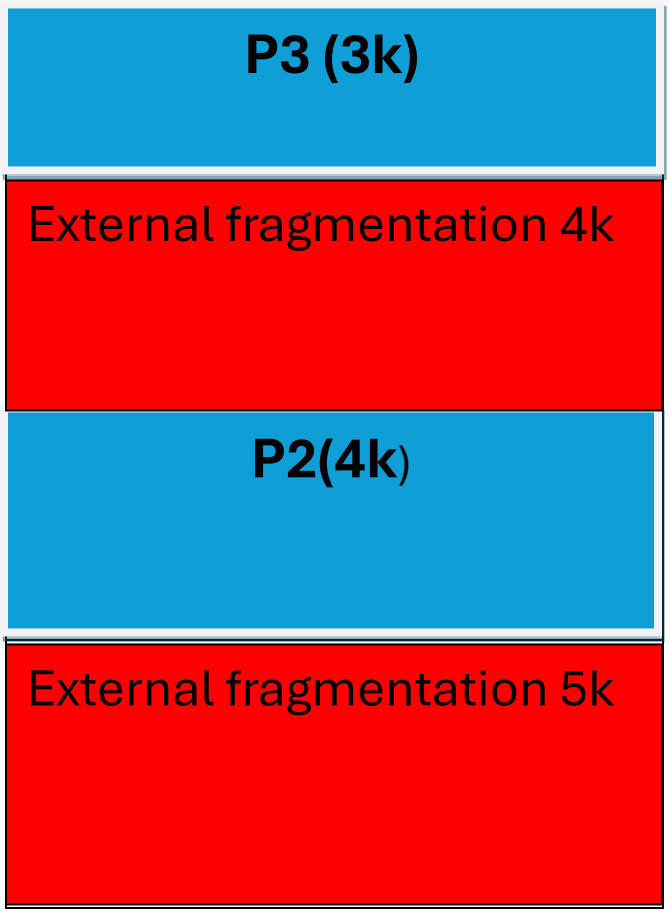
d. 3, 444

996+444=1440

e. 0, 222

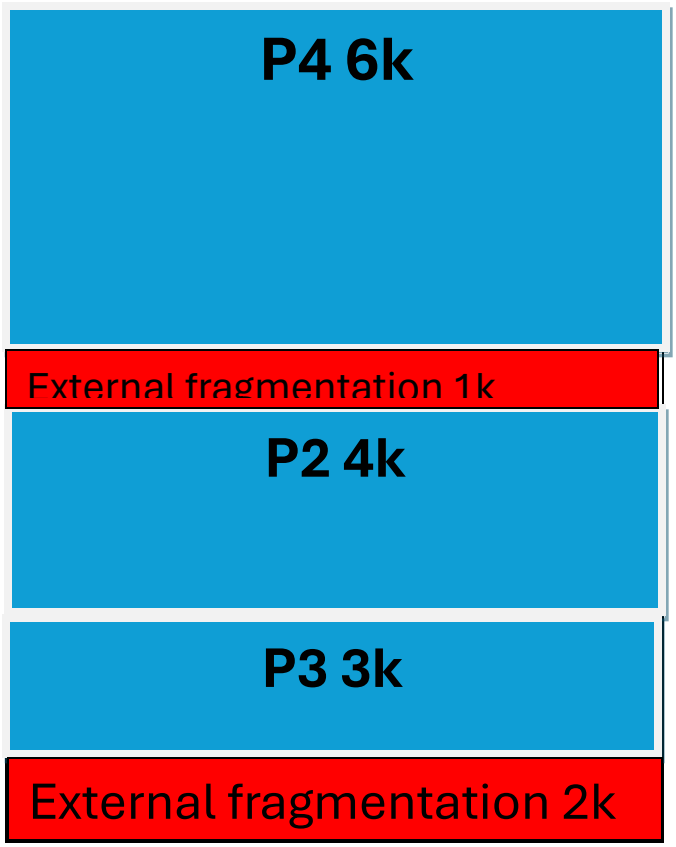
660+222=882

Q13) a. first fit

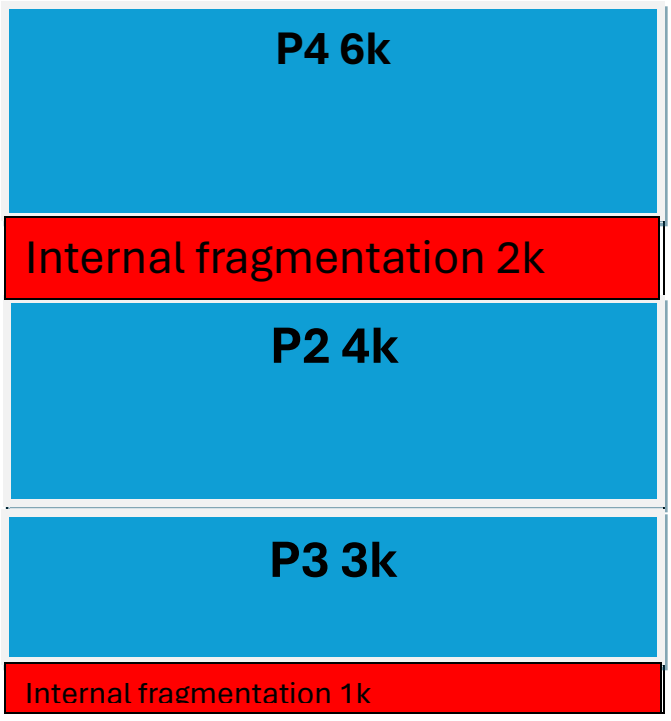


P4 6k cannot be loaded.

b. best fit



c. buddy



d. simple paging (assume that each page is of size 2K)