USN

Internal Assessment Test 2 – December 2024

Sub:	**Operating Systems**				Sub Code:	BCS303	Branch:	ISE
Date:	**/12/2024**	Duration:	90 min’s	Max Marks: 50	Sem/Sec:	III A, B & C		OBE

<table>
<tr><th></th><th><u>Answer any FIVE FULL Questions</u></th><th>MARKS</th><th>CO</th><th>RB</th></tr>
<tr><td>1</td><td>Considering a system screenshot with five processes P0 through P4 and three resources of type A, B, C. Resource type A has 10 instances, B has 5 instances and type C has 7 instances. Suppose at time t0 following snapshot of the system has been taken:
<table>
<tr><th>Process</th><th colspan="3">Allocation</th><th colspan="3">Max</th><th colspan="3">Available</th></tr>
<tr><td></td><td>A</td><td>B</td><td>C</td><td>A</td><td>B</td><td>C</td><td>A</td><td>B</td><td>C</td></tr>
<tr><td>P0</td><td>1</td><td>1</td><td>2</td><td>5</td><td>4</td><td>4</td><td>3</td><td>2</td><td>1</td></tr>
<tr><td>P1</td><td>2</td><td>1</td><td>2</td><td>4</td><td>3</td><td>3</td><td></td><td></td><td></td></tr>
<tr><td>P2</td><td>3</td><td>0</td><td>1</td><td>9</td><td>1</td><td>3</td><td></td><td></td><td></td></tr>
<tr><td>P3</td><td>0</td><td>2</td><td>0</td><td>8</td><td>6</td><td>4</td><td></td><td></td><td></td></tr>
<tr><td>P4</td><td>1</td><td>1</td><td>2</td><td>2</td><td>2</td><td>3</td><td></td><td></td><td></td></tr>
</table>
Answer the following Using Banker’s algorithm,
1. What are the contents of Need Matrix?
2. If a process P1 is requesting for (1,1,0,0) can the request be granted immediately? Explain the algorithm and derive the safe sequence of process execution</td><td>10</td><td>CO3</td><td>L</td></tr>
<tr><td>2</td><td>Explain with a diagram, how TLB is used to solve the problem of simple paging scheme</td><td>10</td><td>CO4</td><td>L</td></tr>
<tr><td>3</td><td>Consider the following page reference string: 7 0 2 0 3 0 4 2 3 0 3 2 2 0 7 0 1.
How many page faults would occur for the following replacement algorithms
a. LRU replacement b. FIFO replacement c. Optimal replacement.
Assuming frame size=3.</td><td>10</td><td>CO4</td><td>L</td></tr>
<tr><td>4a</td><td>Given the memory partitions of 100K, 500K, 200K, 300K, AND 600K. Apply First fit, Best Fit and Worst Fit algorithm to place 212K, 417K, 112K, 426K.</td><td>5</td><td>CO4</td><td>L</td></tr>
<tr><td>4b</td><td>Define Thrashing. What are the main causes of thrashing</td><td>5</td><td>CO4</td><td>L</td></tr>
<tr><td>5</td><td>What is a file? Distinguish between contiguous file allocation and linked file allocation methods with the neat diagram.</td><td>10</td><td>CO5</td><td>L</td></tr>
<tr><td>6</td><td>Suppose that a disk drive has 200 cylinders, numbered 0 to 199. The drive is currently serving a request at cylinder 53 and the previous request was at cylinder 12. The queue of pending requests in FIFO order is:
98, 183, 37, 122, 14, 124, 65, 67
Starting from the current head position, what is the total distance (in cylinder) that the disk arm moves to satisfy all pending requests for each of the following disk scheduling algorithms a) FCFS b) SSTF c) SCAN iv) C-SCAN</td><td>10</td><td>CO3</td><td>L</td></tr>
</table>

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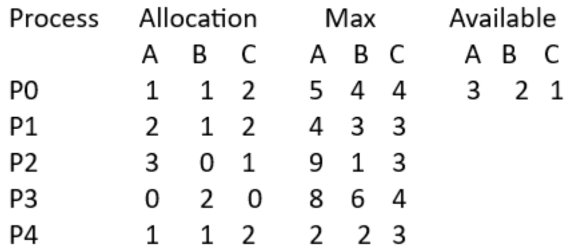
Answer any FIVE FULL Questions	MARKS	CO	RBT

1 Considering a system screenshot with five processes P0 through P4 and three resources of type A, B, C. Resource type A has 10 instances, B has 5 instances and type C has 7 instances. Suppose at time t0 following snapshot of the system has been taken:

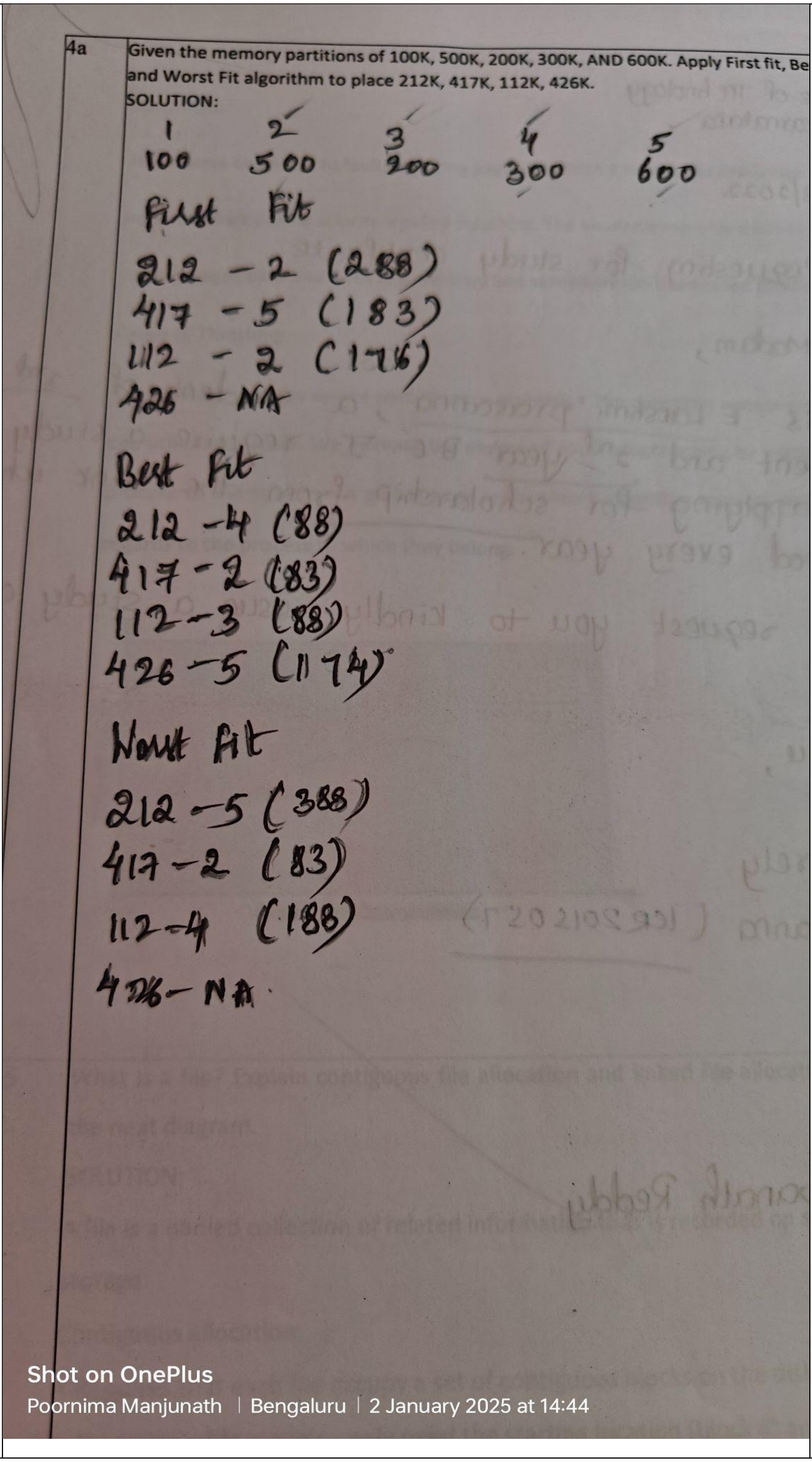


Process	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P0	1	1	2	5	4	4	3	2	1
P1	2	1	2	4	3	3			
P2	3	0	1	9	1	3			
P3	0	2	0	8	6	4			
P4	1	1	2	2	2	3			

Answer the following Using Banker's algorithm,

3. What are the contents of Need Matrix?
4. If a process P1 is requesting for (1,1,0,0) can the request be granted immediately? Explain the algorithm and derive the safe sequence of process execution

SOLUTION:



4a Given the memory partitions of 100K, 500K, 200K, 300K, AND 600K. Apply First fit, Be
and Worst Fit algorithm to place 212K, 417K, 112K, 426K.

SOLUTION:

1	2	3	4	5
100	500	200	300	600

First Fit

212 - 2 (288)
417 - 5 (183)
112 - 2 (176)
426 - NA

Best Fit

212 -4 (88)
417-2 (83)
112-3 (88)
426-5 (174)

Worst Fit

212-5 (388)
417-2 (83)
112-4 (188)
426-NA.

2 Explain with a diagram, how TLB is used to solve the problem of simple paging scheme

SOLUTION:

Working:

- When a logical-address is generated by the CPU, its page-number is presented to the TLB. If the page-number is found (TLB hit), its frame-number is immediately available and used to access memory
- If page-number is not in TLB (TLB miss), a memory-reference to page table must be made.

The obtained frame-number can be used to access memory

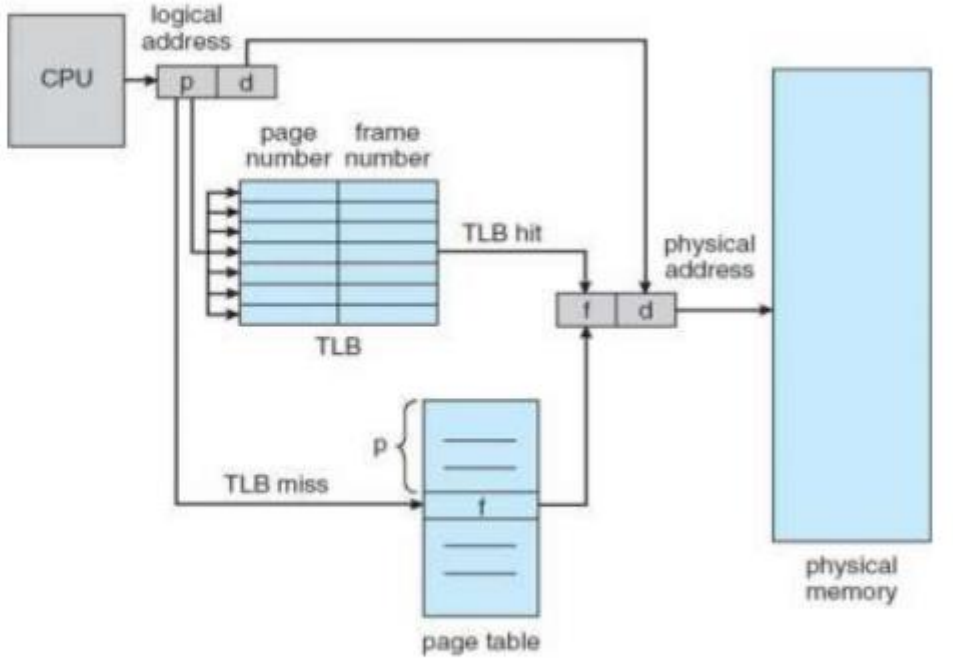


Figure 1: Paging hardware with TLB

- In addition, we add the page-number and frame-number to the TLB, so that they will be found quickly on the next reference.

If the TLB is already full of entries, the OS must select one for replacement.

Percentage of times that a particular page-number is found in the TLB is called hit ratio.

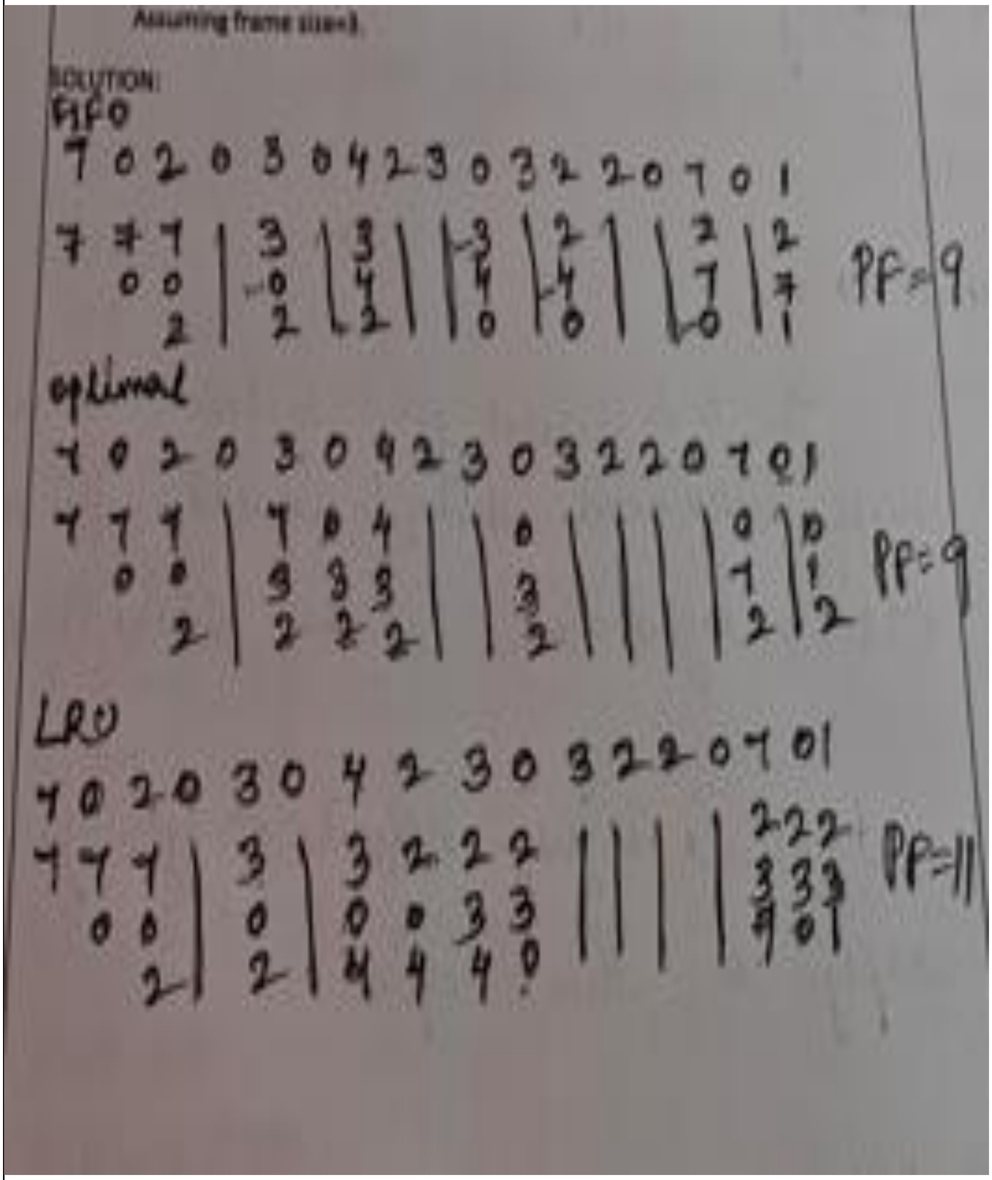
3

Consider the following page reference string: 7 0 2 0 3 0 4 2 3 0 3 2 2 0 7 0 1.
How many page faults would occur for the following replacement algorithms

b. LRU replacement b. FIFO replacement c. Optimal replacement.

Assuming frame size=3.

SOLUTION:



Assuming frame size=3.

SOLUTION:

FIFO

7 0 2 0 3 0 4 2 3 0 3 2 2 0 7 0 1

```
7 7 7 | 3 | 3 | | 3 | 2 | | 2 | 2
  0 0 | 0 | 4 | | 4 | 4 | | 7 | 7    PF=9
    2 | 2 | 2 | | 0 | 0 | | 0 | 1
```

optimal

7 0 2 0 3 0 4 2 3 0 3 2 2 0 7 0 1

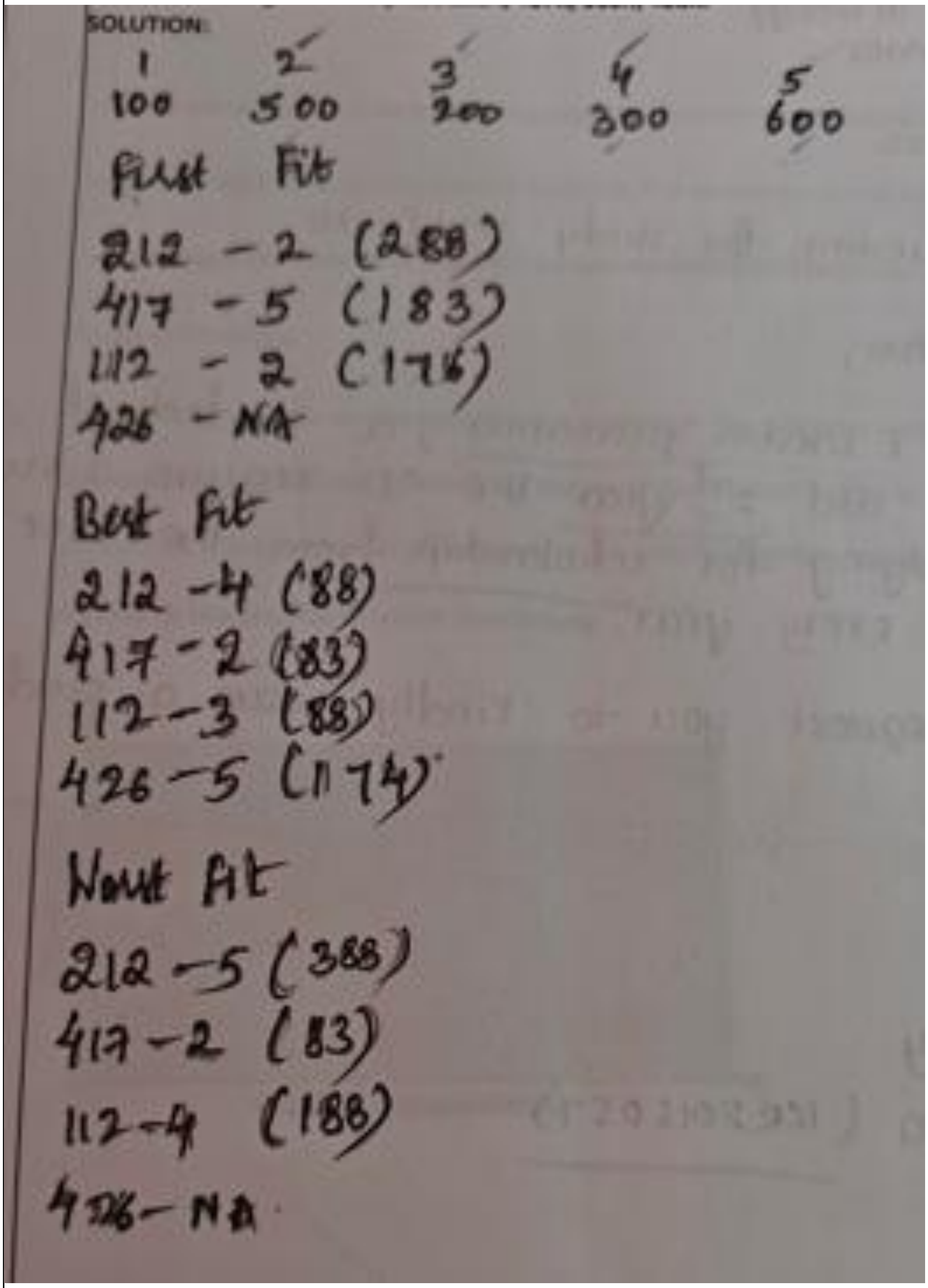
```
7 7 7 | 7 0 4 | | 0 | | | | 0 | 0
  0 0 | 3 3 3 | | 3 | | | | 7 | 1    PF=9
    2 | 2 2 2 | | 2 | | | | 2 | 2
```

LRU

7 0 2 0 3 0 4 2 3 0 3 2 2 0 7 0 1

```
7 7 7 | 3 | 3 2 2 2 | | | | 2 2 2
  0 0 | 0 | 0 0 3 3 | | | | 3 3 3    PF=11
    2 | 2 | 4 4 4 0 | | | | 7 0 1
```

4a	Given the memory partitions of 100K, 500K, 200K, 300K, AND 600K. Apply First fit, Best Fit and Worst Fit algorithm to place 212K, 417K, 112K, 426K. SOLUTION:			

4b	 SOLUTION: 1 2 3 4 5 100 500 200 300 600 First Fit 212 - 2 (288) 417 - 5 (183) 112 - 2 (176) 426 - NA Best Fit 212 -4 (88) 417-2 (83) 112-3 (88) 426-5 (174) Next Fit 212-5 (388) 417-2 (83) 112-4 (188) 426- NA			

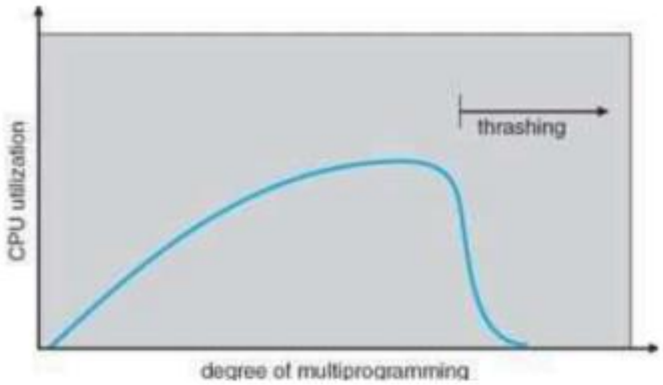
Define Thrashing. What are the main causes of thrashing

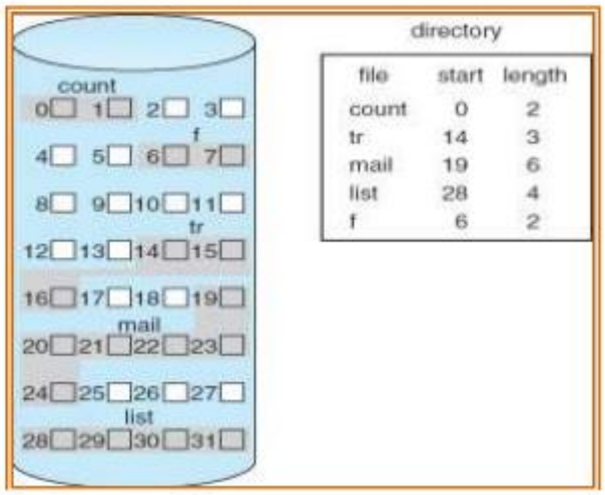
SOLUTION:

The process continues to fault, replacing pages for which it then faults and brings back. This high paging activity is called thrashing. The phenomenon of excessively moving pages back and forth b/w memory and secondary has been called thrashing.

Cause of Thrashing

• Thrashing results in severe performance problem.• The operating system monitors the cpu utilization is low. We increase the degree of multi programming by introducing new process to the system.• A global page replacement algorithm replaces pages with no regards to the process to which they belong.

	 			
5	What is a file? Explain contiguous file allocation and linked file allocation methods with the neat diagram. SOLUTION: A file is a named collection of related information that is recorded on secondary storage. Contiguous allocation: • Requires that each file occupy a set of contiguous blocks on the disk • Accessing a file is easy – only need the starting location (block #) and length (number of blocks) • Contiguous allocation of a file is defined by the disk address and length (in block units) of the first block. If the file is n blocks long and starts at location b, then it occupies blocks b, b + 1, b + 2, ... ,b + n - 1. The directory entry for each file indicates the address of the starting block and the length of the area allocated for this file. • Accessing a file that has been allocated contiguously is easy. For sequential access, the file system remembers the disk address of the last block referenced and when necessary, reads the next block. For direct access to block i of a file that starts at block b, we can immediately access block b + i. Thus, both sequential and direct access can be supported by contiguous allocation.			

<table>
<tr>
<td></td>
<td>


directory
<table>
<tr><th>file</th><th>start</th><th>length</th></tr>
<tr><td>count</td><td>0</td><td>2</td></tr>
<tr><td>tr</td><td>14</td><td>3</td></tr>
<tr><td>mail</td><td>19</td><td>6</td></tr>
<tr><td>list</td><td>28</td><td>4</td></tr>
<tr><td>f</td><td>6</td><td>2</td></tr>
</table>

Linked Allocation:

- Solves the problems of contiguous allocation
- Each file is a linked list of disk blocks: blocks may be scattered anywhere on the disk
- The directory contains a pointer to the first and last blocks of a file
- Creating a new file requires only creation of a new entry in the directory
- Writing to a file causes the free-space management system to find a free block

➢This new block is written to and is linked to the end of the file

➢Reading from a file requires only reading blocks by following the pointers from block to block.

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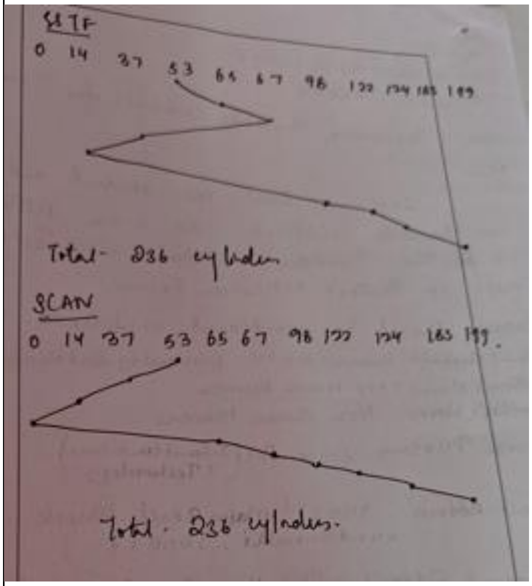
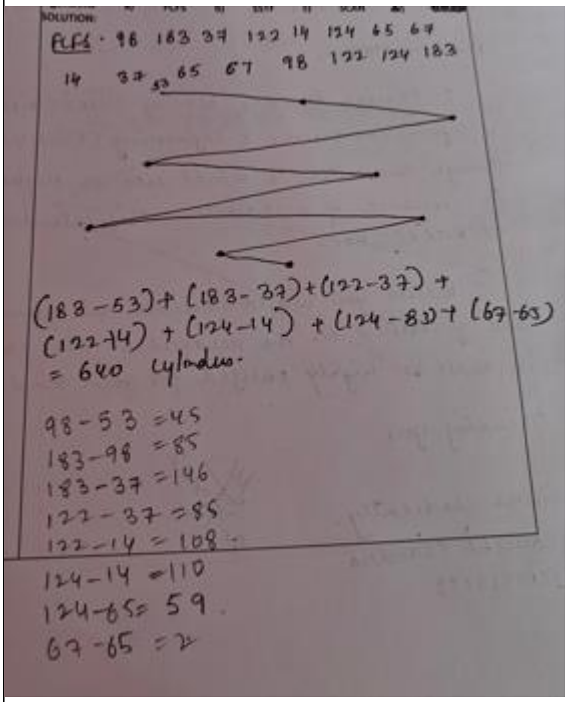
	algorithms a) FCFS b) SSTF c) SCAN iv) C-SCAN SOLUTION:  SSTF Total- 236 cylinders SCAN Total · 236 cylinders.  FCFS · 98 183 37 122 14 124 65 67 (183-53)+(183-37)+(122-37)+ (122-14)+(124-14)+(124-83)+(67-65) = 640 cylinders. 98-53 =45 183-98 =85 183-37 =146 122-37 =85 122-14 =108. 124-14 =110 124-65= 59. 67-65 =2			