

# Operating Systems ST2

Attempt ALL 5 questions. Each question carries 3 marks.

Write each answer as a single paragraph. Do not press "Enter" while writing an answer.

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### Q1. What is segmentation. What is its utility?

Segmentation is a memory management scheme where the linear memory is logically partitioned into segments each having a unique purpose. Segmentation is a way of dividing a process into several modules/segments, where each module contains related information of one type. These modules may or may not be of the same size. These modules are stored in main memory. A program can contain segments like code segment, data segment, stack segment, etc. Example: a code/data can be divided into several segments like `main()`, `function1()`, `function2()`. Segmentation is used to overcome internal fragmentation and also Segment Table consumes less space in comparison to Page table in paging.

### Q2. What is virtual memory? How it helps programmers?

Virtual memory is a technique that allows the execution of processes that are not completely in memory. Some pages of a process are loaded into the main memory and the rest of the pages of the process reside in secondary memory. Hence secondary memory can be addressed as though it were part of main memory. This creates a virtual environment which allows to execute multiple processes even if a process isn't completely inside the main memory. Hence it increases the degree of multi-level programming where many processes can be executed at the same time.



### Q3. Explain any one model for avoiding thrashing.

working set model: 1. this principle states that if we allocate enough frames to a process to accommodate its current locality, it will only fault whenever it moves to some new locality. 2. But if the allocated frames are lesser than the size of the current locality, the process is bound to thrash. According to this model, based on a parameter A, the working set is defined as the set of pages in the most recent 'A' page references. Hence, all the actively used pages would always end up being a part of the working set. The accuracy of the working set is dependent on the value of parameter A. If A is too large, then working sets may overlap. On the other hand, for smaller values of A, the locality might not be covered entirely.

WSSi = working-set size of Pi.

total demand of frames i.e  $D = \text{summation}(WSS_i)$ .

let  $m$  = number of frames

if  $D > m$ , then there will be thrashing so we swap out one or more processes

this keeps degree of multiprogramming as high as possible and optimizes CPU utilization.

keeping track of working-sets is difficult.

### Q4. Differentiate between SCAN and C-SCAN algorithms.

In C-SCAN disk scheduling algorithm, the only difference with respect to SCAN algorithm is that, it is designed to provide more uniformity in waiting time. In C-SCAN algo, head or pointer iterates in a single direction i.e., it scans for the requests all the way to a direction and once it reaches the end, it jumps back to another end and services the requests in the same direction whereas in SCAN it does it in both reversed and forward direction, after reaching one end it reverses its direction.

### Q5. Differentiate between internal fragmentation and external fragmentation.

Internal Fragmentation : 1. holes are created in fixed partitioning while assigning one process, hence no other process can be accommodated within the partition, causing memory wastage, causing internal fragmentation. 2. Internal fragmentation happens when the method or process is larger than the memory. 3. It occurs when memory is divided into fixed sized partitions. 4. this can be minimised using best-fit block. External Fragmentation : 1. The unused spaces formed between non-contiguous memory fragments are too small to serve a new process. 2. it occurs when the process is removed from the main memory, creating holes. 3. it can be removed by paging.



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