

### Tutorial 3; Memory Management

#### Exercise 1

Given a memory management system organized into several **variable partitions** with one **free block = 200 KB**.

The user requests to execute programs of sizes: **60 KB, 32 KB, 75 KB, 15 KB, 30 KB**

**Question1:** - Can we execute the last program?

**Question2:** Draw the memory layout after allocation of all programs.

Then:

- The **75 KB** program finishes, then the **60 KB** program finishes.

- The user runs again: **30 KB**, then **17 KB**

**Question3:** Draw the memory layout after allocating these two programs using: **First-Fit, Best-Fit, Worst-Fit**

#### Exercise 2

Consider a virtual memory system using paging:

Page size = **1 KB**

User memory = **4 KB**

**Question1-** How many page frames are initially available?

A program of size **8 KB** references the following logical addresses:

**1, 2076, 85, 1500, 3648, 100, 4314, 1025, 89, 5741, 1219, 4500, 7658, 4096, 6999, 7191, 5140, 128**

**Question2-** Determine the pair (**page, offset**) for each memory reference.

**Question3:** Deduce the reference string.

**Question4:** - Compute the page fault rate using: **FIFO, LRU, Optimal (OPT)**

**Question5** - Which algorithm **minimizes** the **fault rate**?

### Exercise 3: Segmentation

Segment Table:

segment	Présence in memory	mémoire Adresse	Size
0	1	678	222
1	1	2048	512
2	1	64	300
3	1	3248	128
4	1	998	1024

**Question1:** -

Find the physical addresses corresponding to: **(1,45), (0,200), (1,468), (2,115), (3,56), (4,600), (4,1012)**

### Exercise 4

A computer provides each process with an address space of **65536 bytes**, divided into **pages of 4096 bytes**.

Program P consists of:

**Code: 32768 bytes**

**Data: 16386 bytes**

**Stack: 15870 bytes**

**Question1-** What memory sharing model is used?

**Question2-** Can the program fit into the address space?

**Question3-** If **page size = 8 bytes**, redo the question.

Note: A page cannot contain parts of two different segments.

### Additional Problem

Main memory = 7000 bytes

Segments:

S1 = 3030 bytes

S2 = 2200 bytes

S3 = 2009 bytes

Page size = 1000 bytes

**Questions:**

1. What type of memory allocation is used? Why?

2. Can the whole program be loaded into memory? Why?

- Compute number of real and virtual pages.

- Compute physical addresses for:

(2, 200) and (3, 540)