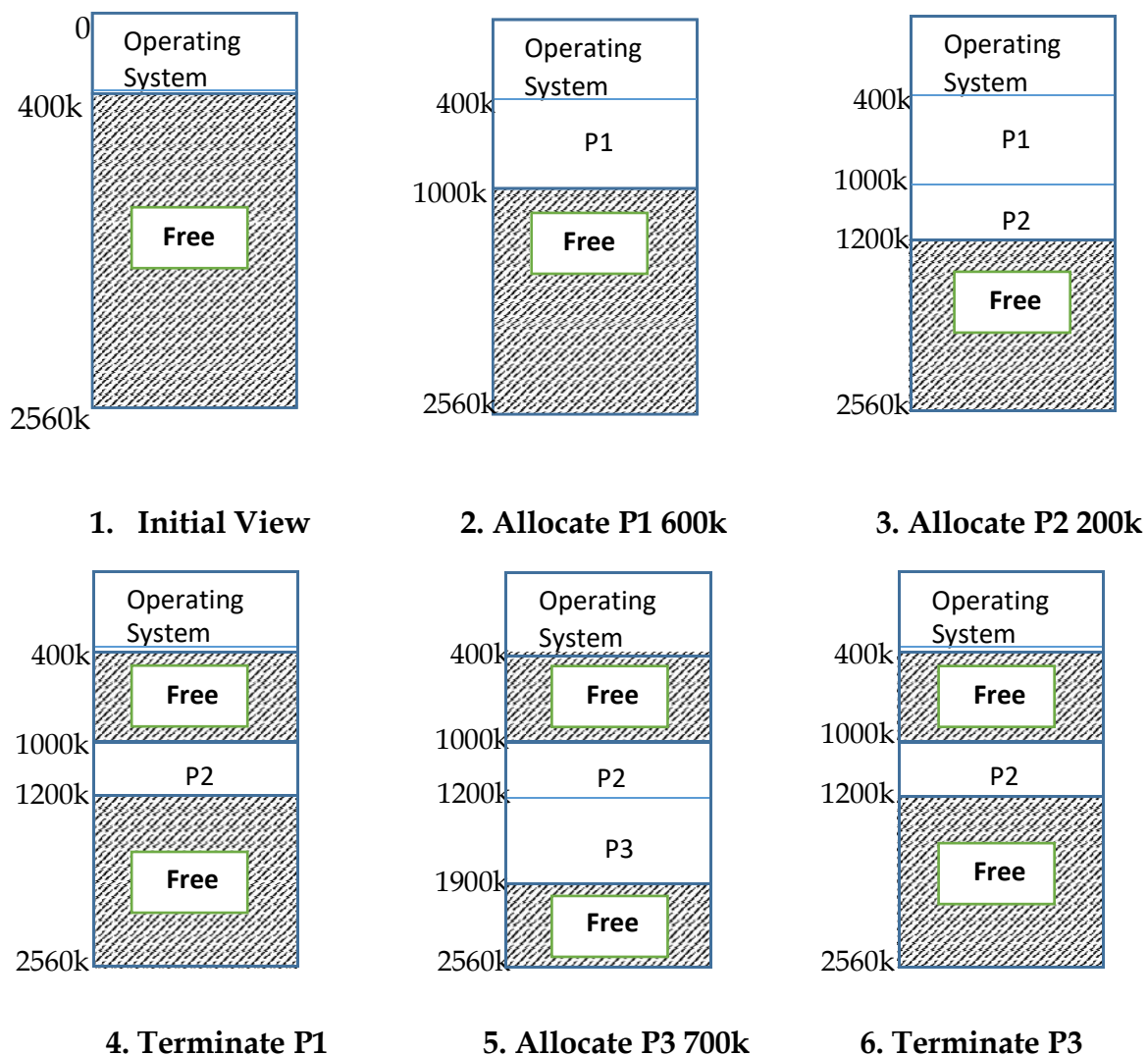


#### Question 1

**Memory Management** is the act of managing computer memory at the system level. The essential requirement of memory management is to provide ways to dynamically allocate portions of memory to programs (user processes) at their request, and free it for reuse when no longer needed. Consider the following scenario in relation to the “**First Fit Algorithm**” in memory management.

Each user process (job) requests a particular size of memory that must be made available contiguously (one block). If such a memory partition exists, it is allocated to the requested process. If that memory partition is **too large to accommodate the process, the memory block is divided into two parts**. One to accommodate the process and other one is kept as a free space block. When a job terminates, its allocated block of memory becomes a free space. If one assumes the memory size is 2560k and 400k is **allocated for operating system files**, the remaining memory is **reserved for user processes**. An illustrative example of the memory management is given below.



Use C programming language to implement a Memory Management scenario using pointers and appropriate data structure. You should design a suitable interface to input the ProcessID along with the memory size it requires.

Your code should include the relevant class definitions and method definitions (for allocating and releasing memory). A method to print a current snapshot of the memory is also required.

Identify appropriate data structure (you have to mention explanation for choosing that data structure in your report)

Test your code for the following scenario.

- Allocate P1 600k
- Allocate P2 1000k
- Allocate P3 300k
- Terminate P2
- Allocate P4 700k
- Terminate P1
- Allocate P5 400k

## Question 2

Write a C program which implements a solution to the sleeping barber problem

Details of the sleeping barber synchronization problem:

- A barbershop consists of a **waiting room with n-1 chairs**, and a **barber room with one chair** (for a total of **n chairs**).
- There are x clients and one barber in the system.
- The following rules apply:
  - If there are **no clients** in his shop, the **barber** goes to **sleep**.
  - If a **client comes** in, and the **barber is asleep**, the client **wakes the barber** and gets a haircut.
  - If the **barber is busy**, and there is a chair available, the **client sits and waits**.
  - If there are **no chairs** available when a client arrives, **he leaves**.

**Note: Your submission should include the following**

- I. Complete C code for the above two scenarios
- II. A report including fully commented programs and valid test data and test results

Upload your submission in a zip file with your INDEX NUMBER to the LMS on or before **04<sup>th</sup> of September 2021** (before **11.55 pm**)

You have to appear for a **viva** of this assignment. The exact date, the time slot for each individual viva will be announced in due course.

## Plagiarism

**Any form of plagiarism is prohibited. (e.g.: Copying from another student, direct downloading from internet, etc.) Any such attempt may result in heavy penalties or failure in the assignment. Hence ensure that you have submitted your own work.**