UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Department of Computer Science

COS 122 Operating Systems

Assignment 4

Due: 22 October 2020 @ 22:00 PM

PLAGIARISM POLICY

UNIVERSITY OF PRETORIA

The Department of Computer Science considers plagiarism as a serious offence. Disciplinary action will be taken against students who commit plagiarism. Plagiarism includes copying someone else's work without consent, copying a friend's work (even with consent) and copying material (such as text or program code) from the Internet. Copying will not be tolerated in this course. For a formal definition of plagiarism, the student is referred to `http://www.ais.up.ac.za/plagiarism/index.htm` (from the main page of the University of Pretoria site, follow the *Library* quick link, and then click the *Plagiarism* link). If you have any form of question regarding this, please ask one of the lecturers, to avoid any misunderstanding. Also note that the OOP principle of code re-use does not mean that you should copy and adapt code to suit your solution.

Objectives

This assignment evaluates the understanding and application of various key concepts and functions found in computer and operating systems. It covers chapters 7 and 8 of the prescribed textbook. This assignment has 5 tasks for a total of 20 marks.

Task 1 ..... (1 marks)

1.1 A snowplow is moving around a circular track. Snow is falling uniformly on the track, and the lone snowplow continually circles the track at constant speed. The snow that is plowed off the track disappears. For which of the page replacement algorithms discussed in Chapter 8 is this a useful analogy? (1)

Task 2 ..... (8 marks)

2.1 A 512 KB block of memory is allocated using the buddy system. Show the results of the following sequence of requests and returns in a table similar to Figure 7.6 of the prescribed textbook. In your table, also provide the internal fragmentation at each stage of allocation/de-allocation. (8)

Request A:100;
Request B:40;
Request C:190
Return A;
Request D:60;
Return B;
Return D;
Return C.

Task 3 ..... (2 marks)

3.1 A systems has a total of 128 frames. There are four processes in the system with the following memory requirements: (2)

$$p_1 : 45; \qquad p_2 : 75; \qquad p_3 : 33; \qquad p_4 : 135$$

Use the Proportional Allocation Algorithm to compute the number of frames allocated to each of the processes.

Task 4 ..... (4 marks)

Assume a task is divided into four equal-sized segments, and the system builds an eight-entry page descriptor table for each segment. Thus, the system has a combination of segmentation and paging. Assume also the page size is 2 KB.

4.1 What is the maximum size of each segment? (1)

4.2 What is the maximum logical address space for the task? (1)

4.3 Assume an element in physical location $00021ABC_{16}$ is accessed by this task. What is the format of the logical address that the task generates for it? What is the maximum physical address space for the system? (2)

Task 5 ..... (5 marks)

Consider a simple segmentation system that has the following segment table:

Segment	Starting Address	Length (bytes)
0	830	346
1	648	110
2	1508	408
3	770	812

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

5.1 : 0, 228 (1)

5.2 : 2, 648 (1)

5.3 : 3, 776 (1)

5.4 : 1, 98 (1)

5.5 : 1, 240 (1)