UNIVERSITEIT VAN PRETORIA
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YUNIBESITHI YA PRETORIA

Department of Computer Science

COS 122 Operating Systems

Assignment 2

Due: 30 September 2021 @ 22:00

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 3 and 4 of the prescribed textbook. This assignment has 4 tasks for a total of 20 marks.

Upload Instructions

You need to provide written answers to the tasks in this assignment. You are then required to submit a document containing these answers in order for them to be marked. Show all the intermediate and calculation steps in your answers (excluding the multiple choice task). Some marks will be awarded for intermediate steps.

- Upload your document to the Assignment 2 assignment slot on COS 122 ClickUP before 22:00 on 30-Sep-2021. **No late submissions will be accepted!**
- All documents must be in either text or PDF format (typed not handwritten) as no other formats will be marked.
- **Failure to upload your answers will result in 0 marks being awarded for your assignment!**

Task 1 ..... (5 marks)

1.1 Which of the following is NOT a reason for process creation: (1)

A. Batch Job
B. OS Subsystem Override
C. User Log-on
D. Parent Process Spawning

1.2 In what state is a process if it is prepared to run and awaiting the opportunity to do so? (1)

A. Running
B. Blocked
C. Ready
D. New

1.3 Which portion of a process image contains executable code: (1)

A. User Data
B. User Program
C. Stack
D. Process Control Block

1.4 What are the fundamental entities that can be scheduled and dispatched to run on one of the system processors? (1)

A. Processes
B. Kernel Threads
C. Lightweight Processes
D. User-level Threads

1.5 _____ is the unit of resource allocation and management. (1)

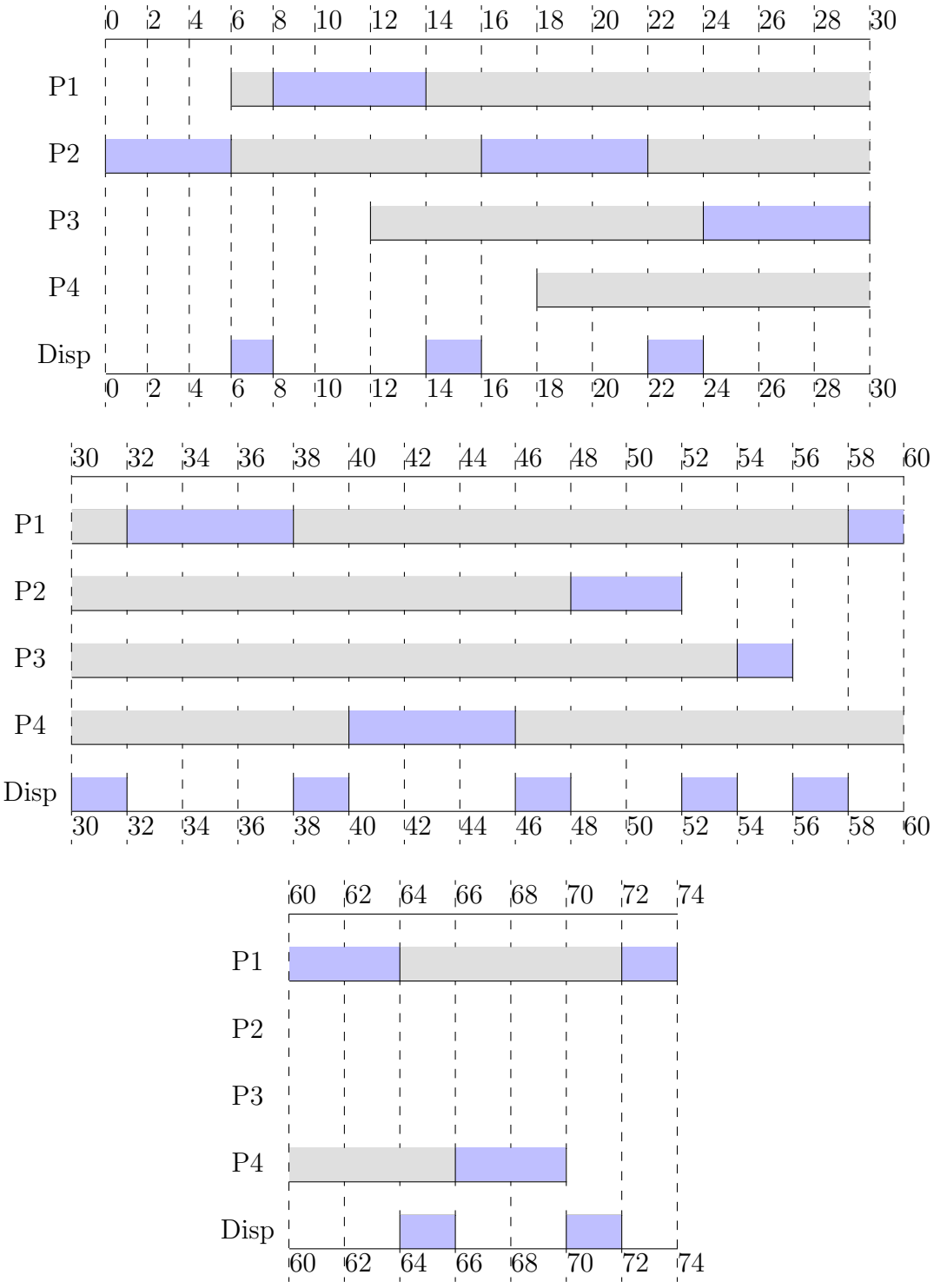
A. Processes
B. User-level Threads
C. Kernel Threads
D. Cores

Task 2 ..... (3 marks)

2.1 An application has 24% of code that is inherently serial. Theoretically, what will its maximum speedup be if run on a multicore system with eight processors? Show all calculations and intermediate steps.Round to the third decimal place. (3)

Task 3 ..... (10 marks)

A system adopts a round-robin scheduling approach, where every process gets the same amount of execution time. In a recorded timespan, the system has four processes P1, P2, P3 and P4, none of which perform any I/O. They are shown in the following sequence diagram:



3.1 What is the dispatch time for the given system? (1)

3.2 What execution time is given to each process? (1)

3.3 What is the average time spent waiting by a process? Show all calculations. (2)

3.4 Explain how the execution would change for process P3 if it instead did have an I/O operation. (2)

3.5 Find the turnaround time for each process, show all steps. (4)

Task 4 ..... (2 marks)

Consider figure 3.9b in the textbook. Answer the following:

4.1 What is the main difference between the Blocked/Suspend and Ready/Suspend states? (1)

4.2 What is a possible scenario that will cause a process to transfer from the running to the blocked state? (1)