DAT 103
Datamaskiner og operativsystemer (Computers and Operating Systems)

Supplementary exercises (Set 3)

Problem 1

Consider an operating system running on a computer system with 16 cores uses the *many-to-many* model to map user threads to kernel threads. If N user threads are created for a particular process and $N > 16$, how many kernel threads will be allocated to this process?

Problem 2

Describe the differences among short-term, and long-term scheduling.

Problem 3

Describe the actions taken by a kernel to context-switch between processes.

Problem 4

What resources are used when a thread is created? How do they differ from those used when a process is created?

Problem 5

What advantage is there in having different time-quantum sizes at different levels of a multilevel queueing system?

Problem 6

Explain the how the following scheduling algorithms discriminate either in favor of or against short processes:

(a) FCFS

(b) RR

(c) Multilevel feedback queues

Problem 7

Consider the following table of arrival time and burst time for three processes P_1, P_2 and P_3:

Process	Arrival Time	Burst Time
P_1	0	9
P_2	1	4
P_3	2	9

The shortest-remaining-time-first (i.e., preemptive shortest job first) scheduling algorithm is used. Scheduling is carried out only at arrival or completion of processes.

(a) Draw the Gantt Chart of the execution.

(b) What is the average waiting time for the three processes?

Problem 8

Consider the following table of processing time and period for two periodic processes P_1 and P_2:

Process	Processing time	Period
P_1	5	8
P_2	3	5

The completion deadlines of each process are the beginning of its next period. For example, the completion deadlines of P_1 are at time $8, 16, 24, \ldots$, while the completion deadlines of P_2 are at time $5, 10, 15, 20, \ldots$.

8.1 Use *Rate-Monotonic Scheduling* to schedule the two processes, where the priority is assigned based on the inverse of each process' period. At *time* $= 20$, can the two processes meet all their deadlines? Draw the Gantt Chart of the execution to justify your answer.

8.2 Use *Earliest Deadline First* to schedule the two processes. At *time* $= 20$, can the two processes meet all their deadlines? Draw the Gantt Chart of the execution to justify your answer.

Hint: Both Rate-Monotonic Scheduling and Earliest Deadline First are priority scheduling with preemption.