Problem

Suppose that you wished to design an OS with the following specifications:

a. The context switch time (time to process a quantum timer interrupt, including scheduling and dispatching) is 100 microseconds. (You coded it as efficiently as possible and measured the time :-)).

b. You want at least 95% processor utilization (i.e., less than 5% time-slicing overhead.)

c. You want to guarantee less than 1/10 second response time.

1. What minimum quantum size (q) is compatible with (a.) and (b.) (Justify your answer)

\[ 5\% \text{ of CPU Time} = \text{Context Switch} = 100 \text{ microseconds} \]

\[ 95\% = 1900 \text{ microseconds} \]

Thus Quantum >= 1900 microseconds

Note: Context Switch is not part of Quantum

2. Incorporating constraint (c.), what is the maximum number of jobs that can be permitted in the READY queue. Justify your answer (note, there is a trick here on the exact number).

\[ 1 \text{ microsecond} = 1 \times 10^{-6} \text{ seconds} \]

Each process will expend Quantum and Context Switch = 2000 microseconds

or 2 \times 10^{-3} \text{ seconds} \]

1/10 second = 1 \times 10^{-1} \text{ seconds} \]

Response Time/Process Time = 1 \times 10^{-1}/2 \times 10^{-3} = 1/2 \times 10^{2} = 50 \text{ Processes} \]

Therefore Maximum < 50 Processes

< because one process is running, therefore the Maximum in the Queue is 49