

HW 4: Response Time and Real-Time Scheduling

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Question 1: Cyclic Executive

Part A

A system's total utilization is given by:

$$\sum_{i=1}^n \frac{C_i}{T_i}$$

Plugging in the values from the problem yields:

$$\frac{1}{3} + \frac{1}{4} + \frac{2}{6} + \frac{1}{12}$$
$$\frac{4 + 3 + 4 + 1}{12} = \frac{12}{12} = 100\%$$

Part B

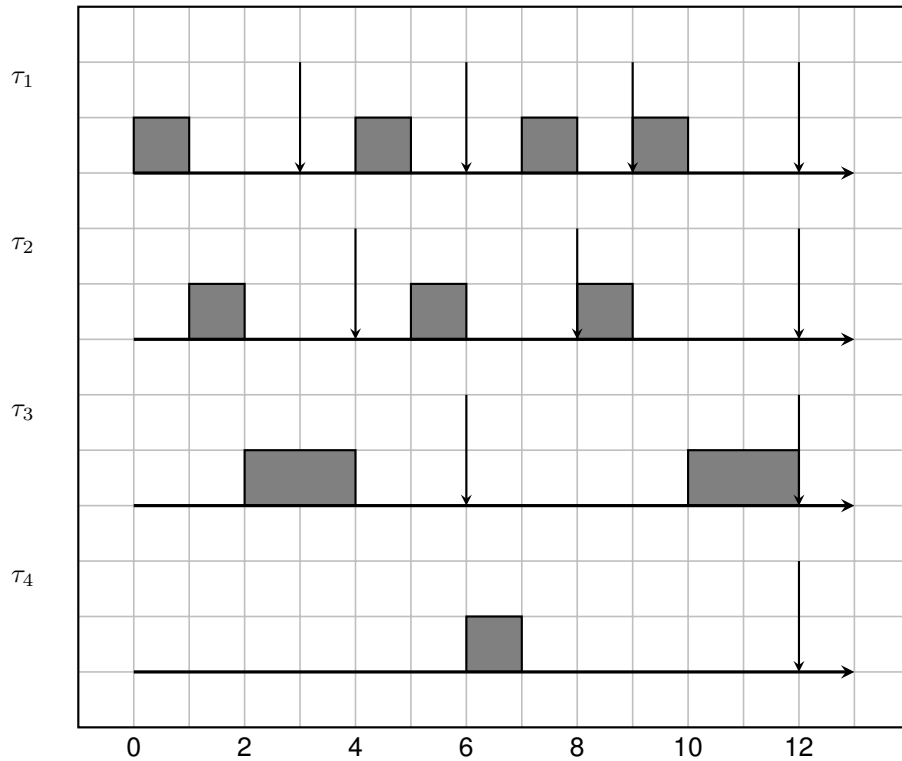


Figure 1: The downward arrow represents the deadline

Question 2: Interrupt Latency

Part A

$$ISRLatency_2^0 = 12$$

$$ISRLatency_2^1 = 12 + \left\lceil \frac{12}{30} \right\rceil 10 + \left\lceil \frac{12}{26} \right\rceil 4 = 12 + 10 + 4 = 26$$

$$ISRLatency_2^2 = 12 + \left\lceil \frac{26}{30} \right\rceil 10 + \left\lceil \frac{26}{26} \right\rceil 4 = 12 + 10 + 4 = 26$$

Max latency is 26 ms.

Part B

$$ISRLatency_2^0 = 24$$

$$ISRLatency_2^1 = 24 + \left\lceil \frac{24}{30} \right\rceil 10 + \left\lceil \frac{24}{26} \right\rceil 4 = 24 + 10 + 4 = 38$$

$$ISRLatency_2^2 = 24 + \left\lceil \frac{38}{30} \right\rceil 10 + \left\lceil \frac{38}{26} \right\rceil 4 = 24 + 20 + 8 = 52$$

Max latency is 52 ms.

Question 3: Preemptive Task Scheduling

Part A

Part B

Part C

Part D