Assignment Dec 22 2022; EXAMPLE

Duration: 60 min (with support of slides and notes)

Student Name: _____

Number:_____

1) Consider an independent and periodic task set, executed in a pre-emptive context:

Task	C (ms)	T (ms)	D (ms)	P (fixed priority)
A	2	6	5	
B	3	12	12	
C	4	15	11	

Assume a fixed priority assignment, based on *Rate Monotonic*. Assign priorities accordingly (fill in the table above): 3 (higher), 2 and 1 (lower). (10%)

2) For the previous task set, represent the time diagram for the RM scheduling, considering the time interval that validates the schedulability of the task set. (25%)

3) For the previous task set example, consider that the worst-case execution time of task C is 5 time units instead, and that task C is the lowest priority task. Compute its worst-case response time using the following analytical approach. (15%)

$$R_i = C_i + \sum_{j \in \mathrm{hp}(i)} \left(\left\lceil \frac{R_i}{Tj} \right\rceil \times C_j \right)$$

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4) Now consider that context switch (e.g. pre-emption / scheduling / dispatching) is not negligible (= 1 time unit). In that situation, is the task set illustrated in 1) still schedulable? Justify (15%)

5) Consider three periodic tasks $\tau 1$, $\tau 2$, and $\tau 3$ (having decreasing priority) that share three resources, A, B, and C, accessed using the Priority Inheritance Protocol (PIP). Compute the maximum blocking time Bi for each task, knowing that the longest duration $\delta i,R$ for a task τi on resource R is given in the following table (there are no nested critical sections). (15%)

	A	B	C
$\tau 1$	3	0	3
$\tau 2$	3	4	0
$\tau 3$	4	3	6

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6) For the task set described in Exercise 5, illustrate the situation produced by RM + PIP in which task $\tau 2$ experiences its maximum blocking time. (20%)