Exam Feb 2023; Example

Duration: 100 mins (with support of slides and notes; not electronic equipment)

Student Name: _____

Number:_____

1) Verify the schedulability and construct the schedule (considering the critical instant for the tasks' response time and the processor synchronous busy interval), assuming the RM (Rate Monotonic) policy for assigning priorities to tasks A, B, C, and that pre-emption is allowed (15%).

   Task *x* (*Ci*, *Ti*) -> Task A (2,6); Task B (2, 8); Task C (2, 12)

2) For the previous task set, determine the worst-case response time (*Ri*) for each of the tasks, considering the RM policy **without** task pre-emption being allowed (15%).

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3) Now consider a task set with the following characteristics:

   Task *x* (*Ci*, *Ti*, *Di*) -> Task A (2, 6, 9); Task B (3, 9, 12); Task C (4, 12, 14)

   Consider that the task set is executed under a EDF (Earliest Deadline First) policy, and that pre-emption is allowed. Is the task set schedulable? Justify the answer. (15%)

4) Consider 4 periodic tasks $\tau 1$, $\tau 2$, $\tau 3$, and $\tau 4$ (having decreasing priority) that share five resources, A, B, C, D, and E, accessed using the Priority Inheritance Protocol. 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	D	E
$\tau 1$	3	6	10	0	7
$\tau 2$	0	0	8	0	0
$\tau 3$	0	4	0	8	14
$\tau 4$	7	0	9	0	11

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5) For the task set as described in 4), illustrate the situation produced by RM + PIP in which task $\tau 2$ experiences its maximum blocking time. (10%)

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6) Consider a multiprocessor system with two processors and Global EDF (G-EDF) for scheduling the following task set:

$\tau_i = (\phi_i, C_i, T_i)$

$\tau_1 = (2, 6, 10)$; $\tau_2 = (3, 2, 9)$; $\tau_3 = (2, 1, 5)$; $\tau_4 = (3, 3, 9)$; $\tau_5 = (0, 7, 12)$

Determine the schedule using synchronous release $\phi = 0$ and using ϕ as the offset parameter (15%)

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7) Exercise related to the PLs (15%):

   TBA