universidade de aveiro
theoria poiesis praxis

# 42081 - SISTEMAS OPERATIVOS E DE TEMPO-REAL

2021-2022

Exam – P, Regular Period Duration: 0h45m

#MEC: _____ Name: _____

**Note 1:** all answers should be properly justified. Just answering Yes/No or writing numerical results without indicating the equations and values used implies that the corresponding answer will not be considered.

**Note 2:** the weight of each question is placed at the beginning, between square brackets. E.g. "[0.5]".

**Note 3:** several answers have a limited size. In such cases the maximum number of lines that can be used is indicated at the end of the question. E.g. "[5 lines]" means that up to 5 lines of text can be used for the answer. Diagrams/figures are not size-limited. Just the text.

1. [3] Does Linux provide schedulers suitable to real-time systems? If so, identify two of such schedulers, stating the main differences among them. [10 lines]

2. [3] Indicate the steps required to make a Xenomai task periodic. Use pseudo-code and describe which are the required instructions, where should they be placed and what they do. Exact syntax is not required.[Pseudo-code + 10 lines]

3. [5] Draw the tasks' state diagram of the multi-tasking real-time kernel FreeRTOS. Briefly describe each state and identify the events that cause transitions between them. [Diagram + 12 lines ]

4. [5] Consider a FreeRTOS task with an (exact and constant) execution time of 5ms. At the end of the task's main loop it is used the instruction "vTaskDelay(xDelay)", where "xDelay" takes the value of 10 and the system tick is set to 2 ms. Draw a diagram that illustrates three successive task jobs. Indicate clearly the relevant events and corresponding time instants. [Diagram + 10 lines]

5. [4] In FreeRTOS task synchronization can be attained, among other techniques, via semaphores and task notifications. Identify one advantage of each one of these methods with respect to the other. [10 lines]