



Introduction to Embedded Systems

Kai Huang

Exercise 3 Resource sharing

Ex 3.1

1. Explain the difference between private, shared and exclusive resources and give an example of problems encountered in exclusive resources.
2. Propose three ways such that the problem occurring in Resource Sharing Problem of mutual exclusion (mutual exclusion) can be solved.
3. Explain the application of a possible solution of the previous part.

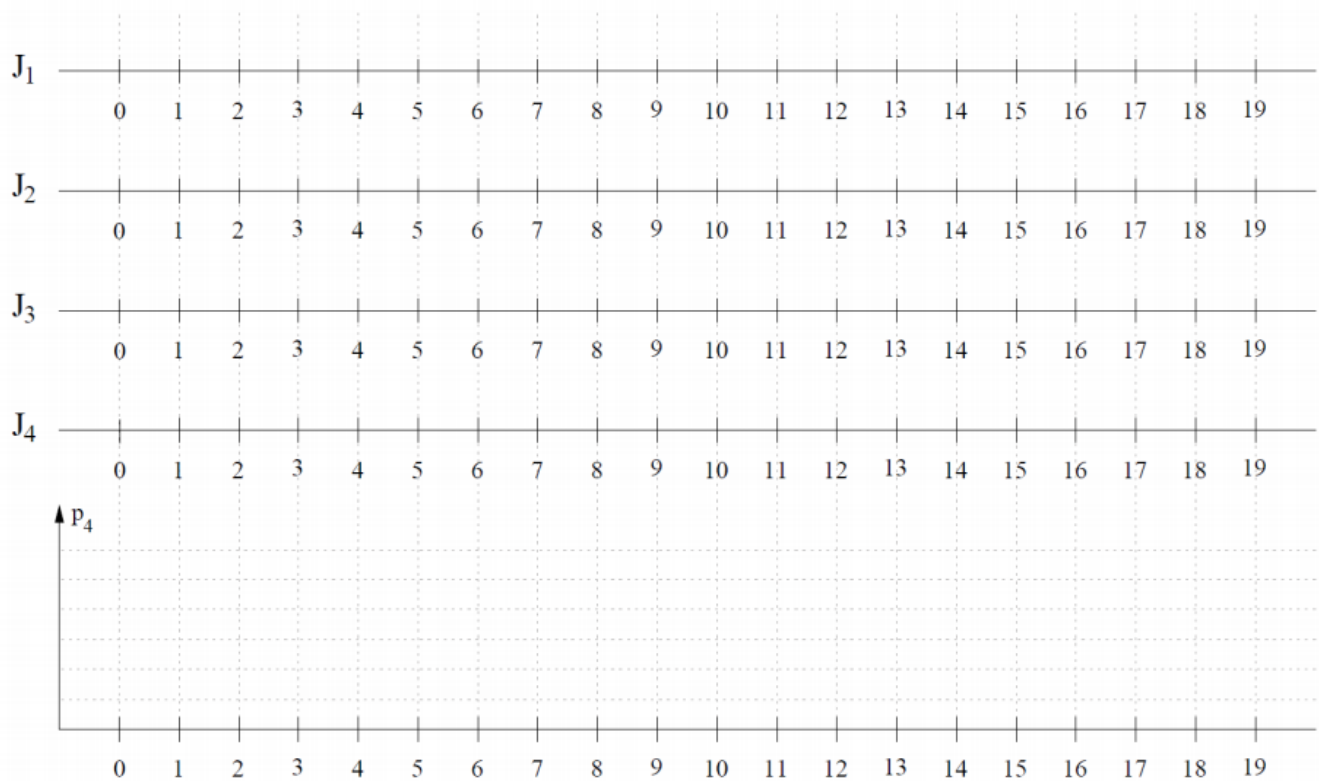
Ex 3.2

1. In the lecture you learned about the Priority Inheritance Protocol (PIP). Does the PIP solve the problem of deadlocks? Give a brief explanation for your response.
2. Given are the four tasks J1, J2, J3 and J4. The table below contains information on their arrival times, deadlines, their execution time and priorities. The tasks with fixed priorities should be handled by a fixed priority scheduling processor as far as possible within their deadlines.
3. The drawings in the last row of the table provide information about the sequence of individual tasks. Each task contains one or more **critical sections**, in which the system accesses the two exclusive resources A and B, respectively. In the drawings, each **block** has one unit of length and non-critical sections are shaded. The critical sections are marked with the corresponding letters A and B. For example, the seven time units long task J4 contains two critical sections, the five time periods long section A and the three time units long section B. A and B are nested here, i.e. during the periods 3-5 J4 must have access to both resource A and resource B.

	J1	J2	J3	J4
Check in	6	5	3	0
Deadline	12	13	16	16
Execution time	3	3	3	7
Nominal priority	highest	medium	medium	lowest
Structure of tasks				

Task:

Now create a scheduling with the Priority Inheritance Protocol and fill out the chart prepared below. **Highlight** the critical Portions of the tasks with the letters A and B as specified in the last line of the table . **Please** also characterized p4 which is the active priority of Task J4 in the given diagram. Note: Pay close attention to the priorities of the individual tasks!



4. Are all deadlines satisfied through the application of the PIP? If not, how big is the maximum delay (maximum lateness) in units of time?
5. Is there a schedule for the tasks specified J_1 to J_4 that meets all deadlines? What changes should be made to the priority? If there is a correct schedule, please show it in the graph provided below. Otherwise, explain why there can be no correct schedule.

