

CMPE 117 - Embedded Software Homework 2 Sample Solutions

Spring Quarter 2003

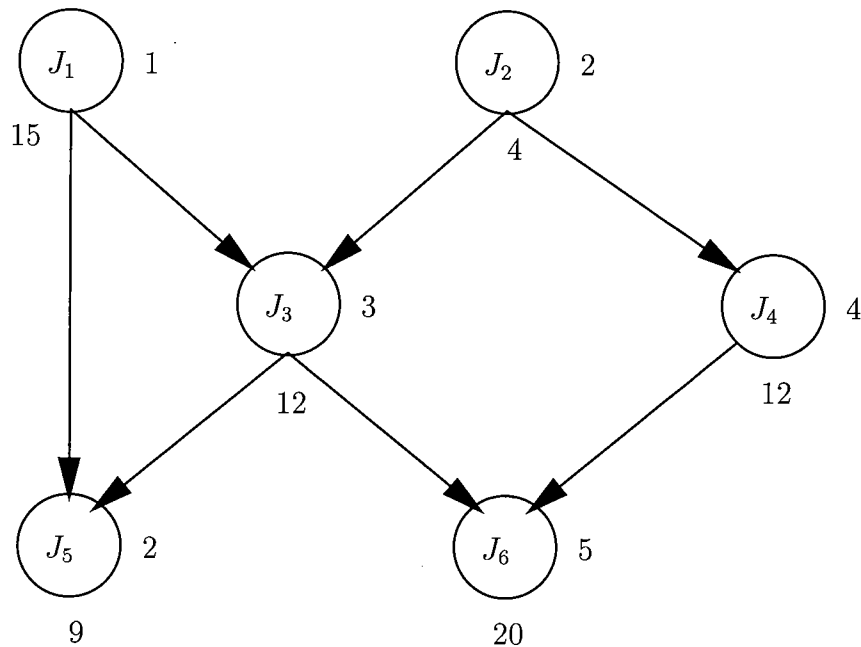
Due Tuesday April 22

Question 1 [30 points]

Consider six **aperiodic** processes $J_1, J_2, J_3, J_4, J_5, J_6$ with release times 0, computation times C_i and deadlines D_i given, for $1 \leq i \leq 6$, by:

	C_i	D_i
J_1	1	15
J_2	2	4
J_3	3	12
J_4	4	12
J_5	2	9
J_6	5	20

and with the dependency relation indicated below:



Question 1, Part 1 [20 pt] Are the processes schedulable? Explain.

By LDL, The schedule is: $J_2 J_1 J_3 J_5 J_4 J_6$

f = finish time

$$f_2 = 2 \leq D_2$$

$$f_1 = 2 + 1 = 3 \leq D_1$$

$$f_3 = 3 + 3 = 6 \leq D_3$$

$$f_5 = 6 + 2 = 8 \leq D_5$$

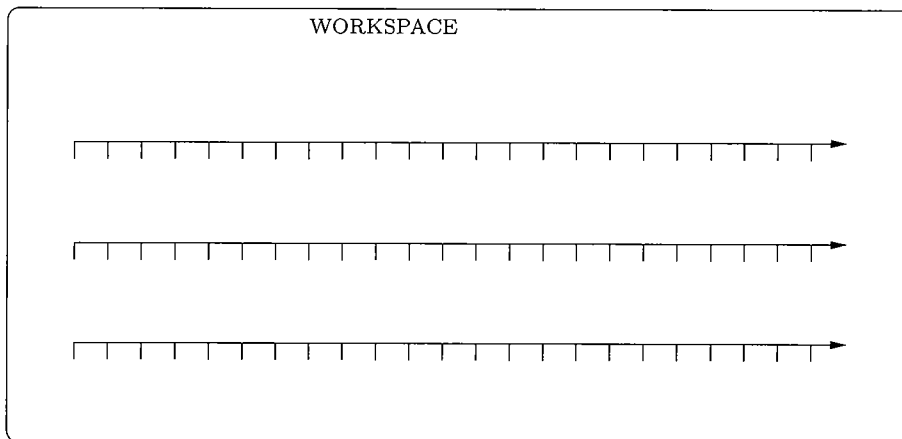
$$f_4 = 8 + 4 = 12 \leq D_4$$

$$f_6 = 12 + 5 = 17 \leq D_6$$

Yes, they are schedulable.

Question 1, Part 2 [10 pt] What is the maximum lateness?

0 (look at J_4)
worst case

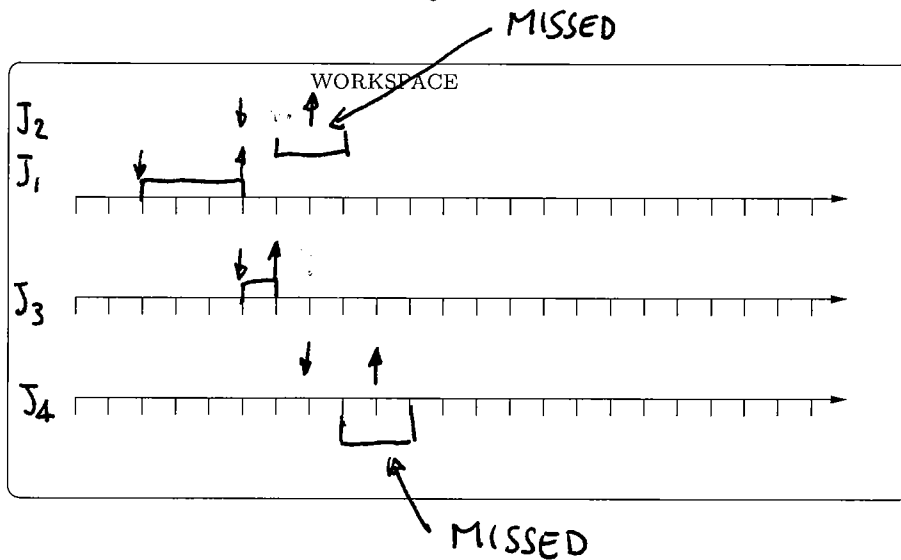
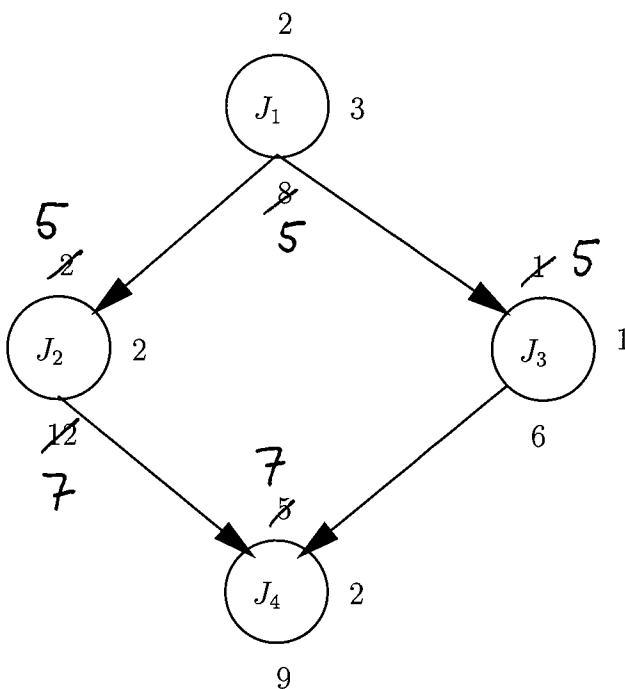


Question 2 [30 points]

Consider four **aperiodic** processes J_1, J_2, J_3, J_4 with computation times C_i , release times r_i , and deadlines D_i given, for $1 \leq i \leq 4$, by:

	r_i	C_i	D_i
J_1	2	3	8
J_2	2	2	12
J_3	1	1	6
J_4	5	2	9

and with the dependency relation depicted below:

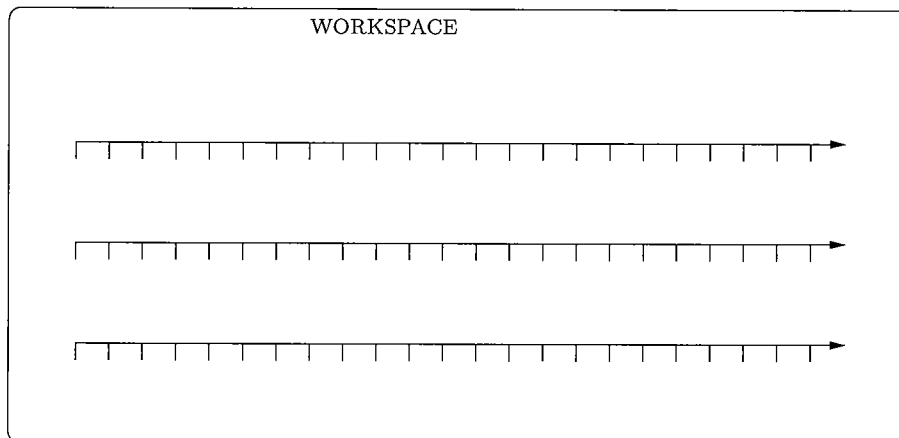


Question 2, Part 1 20 pt] Modify release times and deadlines to schedule the processes with EDF. Suggestion: do it on the picture on the previous page.

See picture.

Question 2, Part 2 [10 pt] Schedule the resulting processes with EDF. Are they schedulable?

No, max lateness = 1 (see figure)



Question 3 [40 points]

Consider four **aperiodic** processes J_1, J_2, J_3, J_4 with computation times C_i , release times r_i , and deadlines D_i given, for $1 \leq i \leq 4$, by:

	r_i	C_i	D_i
J_1	2	4	9
J_2	0	5	12
J_3	4	2	7
J_4	1	2	10

Assume that there is no dependency relation between the processes.

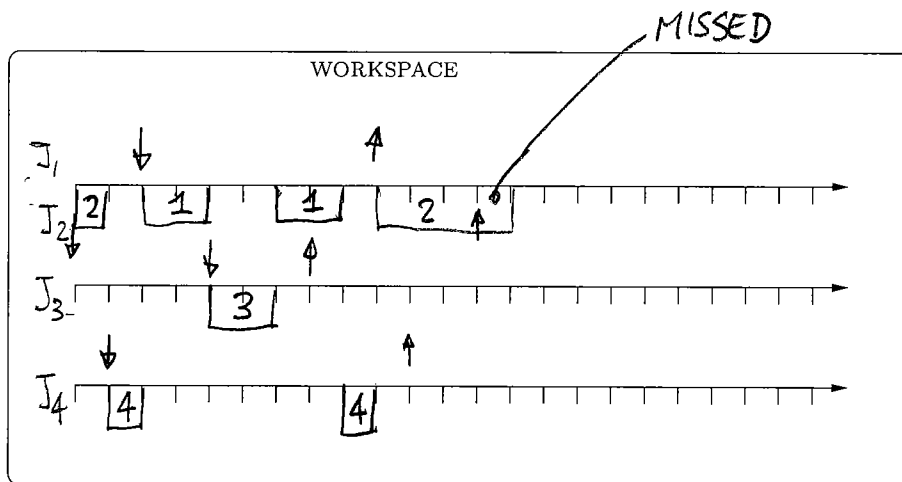
Question 3, Part 1 [10 pt] Are the processes schedulable by EDF? If yes, draw a schedule, if not, explain why.

No. See schedule below.

J_2 misses deadline by 1.

Question 3, Part 2 [10 pt] Are they schedulable by any other method than EDF? Explain.

No, EDF is optimal wrt minimum latency.



$\downarrow = r$
 $\uparrow = D$

Question 3, part 3 [10 pt] Are J_1, J_2, J_3 schedulable? If yes, give the schedule, if not, explain why.

Yes, see schedule below.

Question 3, part 4 [10 pt] Are J_1, J_2, J_3 schedulable, if pre-emption is not allowed? If yes, give the schedule, if not, explain why.

No.
 Consider the ^{interval} period $[2, 9]$, when J_1 can be executed, and $[4, 7]$, when J_3 can be executed. J_3 can start at the latest at 5, and end at the earliest at 6. But there is no way we can hit J_1 in either $[2, 5]$ or $[6, 9]$.

