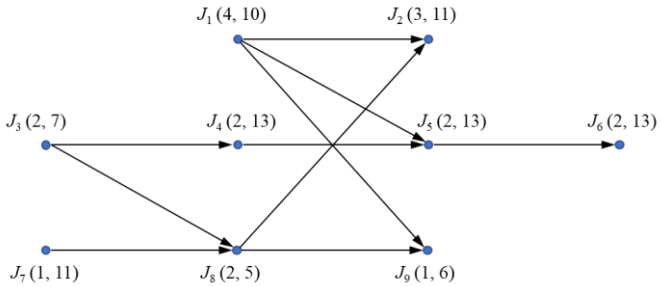
MIDTERM EXAM (Sample)

Problem 1 (2 pts):
Consider the schedule of a researcher. She must do the main job of doing research work from 8h30 AM to 17h30 PM. Assume that on a specific day she has some additional jobs as below.

- 07h00 – 07h30: Have breakfast.
- 07h30: Go to work.
- 11h00: Sending and answering emails. When this is done then go to lunch.
- Finish lunch by 13h00.
- 13h00 – 14h00: Department meeting.
- 14h10 – 16h10: Give lecture.
- Write a recommendation letter for a student. Input information is received at 9h00. The letter should be ready by 17h00.

a. Define the tasks corresponding to the tasks she has to do on that day, including her main job, and identify the arrival time and deadline of each task.
b. Estimate the execution time of each task if possible.
c. List all precedence constraints and draw the precedence graph for this task set.

Problem 2 (5 pts):
Given a task set of 9 preemptible tasks with precedence constraints between tasks shown on the below precedence graph. The arrival time and absolute deadlines of each task are displayed beside them. Execution time of each task is 1.



Select a suitable scheduling algorithm for this problem. Do necessary calculations and produce the schedule based on the selected algorithm. Is this task set schedulable?

Problem 3 (3 pts):
Given the task set $\{T1, T2, \ldots, T5\}$, in which all tasks activate at 0. Execution times are 4, 4, 3, 3, 5, and absolute deadlines are 13, 10, 10, 21, 20, respectively.
Also assume that the task set has precedence constraints listed below:

$$T1 \rightarrow T3, T2 \rightarrow T4, T2 \rightarrow T5$$

Find the appropriate scheduling algorithm to minimize Lmax. Do necessary calculation and procedure to produce the corresponding schedule and Lmax value.

FINAL EXAM (Sample)

Problem 1 (3 pts):
Given the periodic task set with period and execution time as below. The phase of all tasks are 0. The relative deadline of each task is equal to its period.

1. Identify the minor cycle, major cycle, and total processor utilization.
2. Produce a schedule for the task set. Is the schedule feasible?

	T1	T2	T3
Ci	2	1	2
Ti	3	6	18

Problem 2 (5 pts):
A mixed task set contains three periodic tasks $\{Ti(Ci, Ti)\} = \{T1(1,5), T2(1,6), T3(1,7)\}$ in which the relative deadline of each task is equal to its period, and two aperiodic tasks $\{Ji(ai, Ci)\} = \{J1(1,2), J2(10,2)\}$. The rate monotonic algorithm is used for periodic tasks.

1. Assume that a polling server is created to serve aperiodic tasks. Find the maximum utilization of the server to make sure all periodic tasks meet their deadlines. Select suitable values for capacity and period of the server so that it has the highest priority, then produce the corresponding schedule for the whole task set. What is the response time of J1 and J2?
2. If the server is now deferable server instead of polling server. Estimate the server capacity and period so that it has the highest utilization and priority. Produce the corresponding schedule and find response time of J1 and J2.

Problem 3 (2 pts):
A system contains six jobs $\{J1, J2, J3, J4, J5, J6\}$ listed in decreasing order of priority, except for J2 and J3 with the same priority. There are three resources X, Y, and Z in the system; each resource has 1 unit. Also, the amounts of time each job uses the resources are given by the following table.

Jobs	X	Y	Z
J1	1		
J2		7	
J3			1
J4			
J5			2
J6	3	4	

Find the blocking times of each job and the task that causes that blocking time, assume that the priority ceiling protocol is used to control resource access.