补充题：

1. Considering a real-time system, in which there are 4 real-time processes P1, P2, P3 and P4 that are aimed to react to 4 critical environmental events e1, e2, e3 and e4 in time respectively.

The arrival time of each event ei, 1≤i≤4, (that is, the arrival time of the process Pi), the length of the CPU burst time of each process Pi, and the deadline for each event ei are given below. Here, the deadline for ei is defined as the absolute time point before which the process Pi must be completed.

The priority for each event ei (also for Pi) is also given, and a smaller priority number implies a higher priority.

Events	Process	Arrival Time	Burst Time	Priorities	Deadline
e1	P1	0.00	4.00	3	7.00
e2	P2	3.00	2.00	1	5.50
e3	P3	4.00	2.00	4	12.01
e4	P4	6.00	4.00	2	11.00

(1) Draw a Gantt chart illustrating the execution of these processes using the following scheduling algorithms: preemptive priority and FCFS.

(2) What is the average waiting time for each of the scheduling algorithms?

(3) What is the average turnaround time each of the scheduling algorithms?

(4) Which event will be treated with in time for each of the scheduling algorithms? (that is, the process reacting to this event will be completed before its deadline?)

2. There are 6 concurrent processes in the system. The following table shows their priority number, arrival time, and CPU burst time. Assuming a higher number indicating a higher relative priority, and the length of a time quantum is 10ms.

In addition to these processes, the system also has an *idle task* (which consumes no CPU resources and is identified as *Pidle*). This task has priority 0 and is scheduled whenever the system has no other available processes to run.

If a process is preempted by a higher-priority process, the preempted process is placed at the end of the ready queue.

Answer the following questions based on the scheduling algorithm adopted by the system.

(1) Show the scheduling order of the processes using a Gantt chart.
(2) What is the turnaround time for each process?
(3) What is the waiting time for each process?
(4) What is the CPU utilization rate?

Thread	Priority	Burst	Arrival
P_1	40	20	0
P_2	30	25	25
P_3	30	25	30
P_4	35	15	60
P_5	5	10	100
P_6	10	10	105

The scheduling algorithm adopted by the system:
(a) Assuming the round-robin scheduling algorithm is used.
(b) Assuming the non-preemptive priority scheduling algorithm is used.
(c) Assuming the preemptive priority scheduling algorithm is used.
(d) Assuming the non-preemptive priority with round-robin for processes with equal priority scheduling algorithm is used.
(e) Assuming the preemptive priority with round-robin for processes with equal priority scheduling algorithm is used.
(f) Assuming the round-robin with preemptive priority scheduling algorithm is used, a new process with higher priority will preempt the CPU for execution, and executing up to one time slice, when the time slice is runs out, the process is placed at the end of the ready queue.