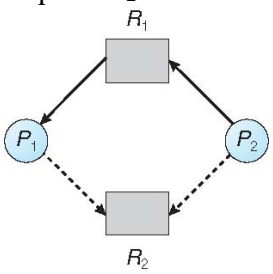
長庚大學110學年度第二學期 資工所博士班資格考試
科目：作業系統

1. (10%) Please define (1) I/O-bound processes and (2) CPU-bound processes.

2. (10%) For the resource-allocation graph scheme, we have:
   - Claim edge $Pi \rightarrow R_j$ indicates that process P_i may request resource R_j; represented by a dashed line
   - Claim edge converts to request edge when a process requests a resource
   - Request edge converted to an assignment edge when the resource is allocated to the process
   - When a resource is released by a process, assignment edge reconverts to a claim edge

   If we adopt deadlock avoidance to manage the deadlock problem, could we grant the request that P_2 request R_2 with the current situation in the following graph?



3. (15%) Consider the following processes, assume that the time unit is one millisecond.
   (1) Draw the scheduling charts for non-preemptive SJF (shortest job first) scheduling and preemptive SJF, i.e., shortest remaining time first. (10%)
   (2) Derive the average waiting time of each scheduling algorithm. (5%)

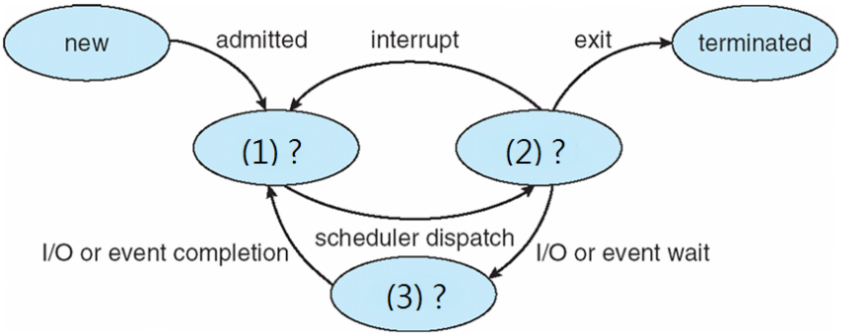
Process	Burst Time (ms)	Ready Time (ms)
P1	4	0
P2	7	1
P3	1	2
P4	2	3
P5	3	4

4. (10%) Explain the difference between a process and a thread. Please also describe the advantage of multi-threading compared to multi-process programming. (10 pts)

5. (10) To manage the deadlock problem, we can do deadlock prevention or deadlock avoidance. Please explain deadlock prevention in detail.

6. (10%) Please explain the procedure of using a Remote Procedure Call (RPC).

7. (10%) The possible states of a process are ready, running, and waiting. Please indicate the states of (1), (2), and (3) of the following figure.



8. (10%) Suppose that a disk drive has 5000 cylinders, numbered from 0 to 4999. The drive is currently serving a request at cylinder 1012, and the previous request was at cylinder 1006. The queue of pending requests, in FIFO order, is 86, 38, 913, 1800, 1458, 56, 1022, 1750, 130. Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests, for each of the following disk scheduling algorithms? (1) SSTF (2) SCAN

9. (15%) Synchronization is a fundamental support provided by operation systems to allow multiple processes and/or threads to access shared data. Peterson's Solution is a well known example provided by OS textbooks. For the second version of Peterson's Solution, as follows, please explain the problem for using the code for processes P_i and P_j. **(10 pts)**

Initially, flag[i]=flag[j]=false

P_i :	P_j :
do {	do {
flag[i]=true;	flag[j]=true;
while (flag[j]) ;	while (flag[i]) ;
critical section	critical section
flag[i]=false;	flag[j]=false;
remainder section	remainder section
} while (1);	} while (1);