長庚大學112學年度第一學期作業系統期末測驗（滿分108）

系級: 姓名: 學號:

1. (10%) For the **second version** of **Peterson's Solution**, please explain the problem when we use the following algorithm for protecting the critical sections of P_i and P_j:

Initially, flag[0]=flag[1]=false

Process P_i :	Process 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);

2. (10%) Let's consider the **Bounded-Buffer Problem**. The pseudo code of **Consumer** is provided as follows. Please provide the pseudo code of **Producer**. After the Producer produces an item in a valuable nextp at the beginning of the loop, you have to note the position for adding the item into the buffer.

```
Consumer:
  do {
        wait(full);  /* control buffer availability */
        wait(mutex);  /* mutual exclusion */
        .......
        remove an item from buffer to nextp;
        ......
        signal(mutex);
        signal(empty);  /* increase item counts */
        consume nextp;
  } while (1);
```

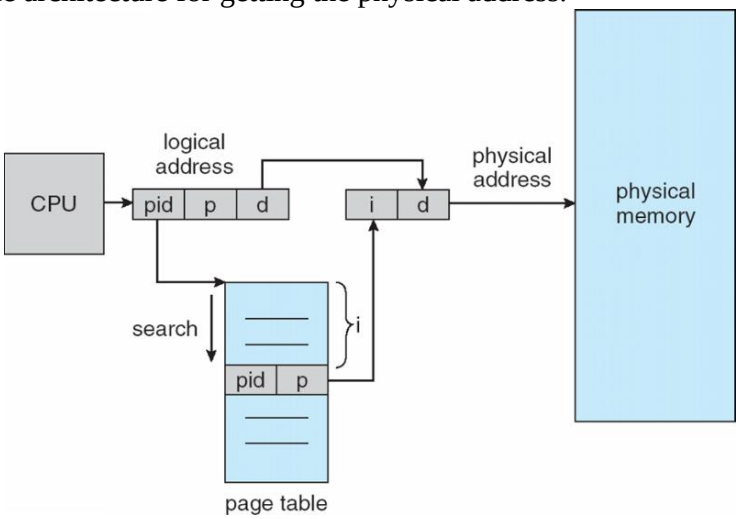
3. (10%) For the Dining-Philosophers problem with the following figure, there could be a deadlock with the situation that each philosopher has picked up a chopstick on the right hand and just waits for the other at left. Please provide one remedy to the deadlock problem.

4. (10%) There are 5 processes {P_0, P_1, P_2, P_3, P_4} and three types of shared resources {A, B, C} in the system, and the details are in the following table. Is the system in a deadlock state? If no, please provide a sequence to complete all processes. If yes, please still try to provide a sequence to complete as many processes as possible, and then indicate the processes which are in the deadlock.

	Allocation			Request			Available		
	A	B	C	A	B	C	A	B	C
P0	0	1	0	0	0	0	0	2	0
P1	2	0	3	5	0	1			
P2	3	0	1	0	3	0			
P3	1	1	1	3	3	1			
P4	4	0	1	0	0	3			

5. (12%) Please define (a) external fragmentation and (b) internal fragmentation of memory management. If we use “Paging” to manage memory, (c) is it possible to have external fragmentation? (d) is it possible to have internal fragmentation? You have to provide reasons for the answers of sub-questions c and d.

6. (10%) For the inverted page table architecture, please briefly explain the mechanism of inverted page table architecture for getting the physical address.



7. (10%) When paging is used for the memory management, please explain the method for two processes to share some binary or data.

8. (10%) There is a system with only 3 memory frames. Given a reference string of pages {7→0→1→2→0→3→0→4→2→4→1→2→4}, please illustrate the page replacement and the queue of (a) FIFO algorithm and (b) LRU algorithm.

9. (8%) (a) Please explain the Copy-on-Write technique. (b) What is the benefit of using Copy-on-Write?

10. (10%) For three periodic tasks P_1, P_2 and P_3. P_1 has its period 30 and execution time 10. P_2 has its period 20 and execution time 5. P_3 has its period 40 and execution time 15. Please draw the scheduling results of (a) the Earliest Deadline First scheduling and (b) the Rate Monotonic Scheduling from time 0 to time 120. If there is any deadline missing, please point it out and stop the scheduling when it has the deadline missing.

11. (8%) For the following sample code of µC/OS-II, please explain the input parameters of function OSTaskCreate(). In other words, please explain the meaning of the parameters Task, (void*)&TaskData[i], &TaskStk[i][TASK_STK_SIZE - 1], and i + 1.

```
static void TaskStartCreateTasks (void)
{
    INT8U i;
    for (i = 0; i < N_TASKS; i++)
    {
        TaskData[i] = '0' + i;
        OSTaskCreate(
            Task,
            (void *)&TaskData[i],
            &TaskStk[i][TASK_STK_SIZE - 1],
            i + 1 );
    }
}
```