中 山 大 学 软 件 学 院 **2010** 级 软 件 工 程 专 业 (2011 春季学期)

《SE-223 操作系统》期末试题试卷（A）

(考 试 形 式： 闭　卷　　考 试 时 间： 2 小 时)

警 示

《中山大学授予学士学位工作细则》第六条

考 试 作 弊 不 授 予 学 士 学 位

方向：_____　　姓名：_____　　学号：_____

出卷：常会友、刘宁、凌应标　　审核：_____

一、**Explain following terms(15 pts)**

1. Semaphore
2. Threads
3. Address mapping
4. PCB
5. File system

二、**Short Answer(25 pts)**

1. Please describe the necessary conditions of deadlock.
2. Please describe the interrupt procedure.
3. What is the difference between paging and demand paging? How OS with demand paging deals with page fault, i.e when refers a page that isn't in the memory?
4. Please describe the difference between cache and buffer.
5. What is the difference between sequential access and random access?

三、(**15 pts**)We consider a system with three resource types(A, B, C) and five process(P1, P2, P3, P4, P5). The number of resource A is 17, resource B is 5, resource C is 20. Consider the following snapshot of the system at time T_0.

process	MAX A B C	Allocation A B C	Available A B C
P1	5 5 9	2 1 2	2 3 3
P2	5 3 6	4 0 2	
P3	4 0 11	4 0 5	
P4	4 2 5	2 0 4	
P5	4 2 4	3 1 4	

Answer the following question using the banker's algorithm:

(1)At time T_0, is the system in a safe state? If it is in a safe state, write down the safe sequence.**(7 pts)**

(2)At time T_0, if a request from process P2 arrives for (0, 3, 4), can the request be granted? Why?**(3 pts)**
(3)At time T_0, if a request from process P4 arrives for (2, 0, 1), can the request be granted? Why?**(5 pts)**

四、(**15 pts**) Consider the logical address of a job is 24 bits, the high-order 8 bits for segment-number, the low-order 16 bits for the offset. Try to answer the following question:
(1)How many segments can a job hold at most?**(3 pts)**
(2)What is the max length of a segment?**(3 pts)**
(3)A segment table as follow, try to calculate the physical address for the following logical address:[0, 430]、[1, 50]、[2, 30]、[3, 70](The first number in square brackets is segment-number, the second is offset). And declare what kind of interrupt will generate, when the logical address can not change to physical address.**(9 pts)**

Segment	Length	Base	Is in the main memory
0	600	2100	Y
1	40	2800	Y
2	100		N
3	80	4000	Y

五、(**15 pts**)A system has a page request management schemes. The access page sequence of a process is 4, 3, 2, 1, 4, 3, 5, 4, 3, 2, 1, 5. The system will use **LRU** page replacement algorithm. Answer the following question: (you need to write down the **computational procedure**)
(1)If the process has 4 frames, write down the page fault sequence and calculate the page fault rate.**(6 pts)**
(2)If the process has 5 frames, write down the page fault sequence and calculate the page fault rate.**(6 pts)**
(3)What can we know from the result of (1) and (2)?**(3 pts)**

六、**Please select and answer ONE of the following two questions**
1.(**15 pts**)Consider a multi-level index file system, there are 13 pointers of disk block in the file's i_node(10 direct index, 1 single indirect index, 1 double indirect index, 1 triple indirect index). A date block is 4K, the disk address is 4 bytes. Try to answer the following question:
(1)What is the max file length in this file system?**(7 pts)**
(2)How many space does a 2GB file actually occupy in this file system? (the i_node does not occupy the space)**(8 pts)**

2.(**15 pts**) Consider a system with three smoker processes and one agent process. Each smoker continuously rolls a cigarette and then smokes it. But to roll and smoke a cigarette, the smoker needs three ingredients: tobacco, paper, and matches. One of the smoker processes has paper, another has tobacco, and the third has matches. The agent has an infinite supply of all three materials. The agent places two of the ingredients on the table. The smoker who has the remaining ingredient then makes and smokes a cigarette, signaling the agent on completion. The agent then

puts out another two of the three ingredients, and the cycle repeats.

(1)According to the following example programs in a C-like language, write out the whole program of the smokers and the agent processes where are omitted; **(5 pts)**

(2)Synchronize the agent and the smokers using counting semaphores.**(10 pts)**

Examples programs of the smoker process with paper and the agent process

```
TableType TABLE;

SmokerA () {    /* the smoker processes with paper */
   CigaretteType    c;
   PaperType    p;
   TobaccoType    t;
   MatchesType    m;
   While (1)
      p= Take_Paper_From_The_Pocket_of_SmokerA();
      t=Take_Tobacco_From_ The_Table(TABLE);
      m=Take_Matches_From _The_Table (TABLE);
      c=Make_A_ Cigarette(p,t);
      Smoking(c);
   }
}
SmokerB () {
    /* the smoker processes with tobacco */
   ……
}
SmokerC () {
    /* the smoker processes with matches */
   ……
}
ServerAgent() {
      /* agent process */
   PaperType    p;
   TobaccoType    t;
   MatchesType    m;
   While (1)
      ch=RandamNumberFrom_1_2_3();
      /* generate a randam number From 1,2 or 3 */
      if (ch= =1)    {
            t= Prepair_Tobacco();
            m= Prepair_Matches();
            Put__Tobacco _To_The_Table(TABLE, t);
            Put_Matches_To_ The_Table (TABLE, m);
       }
```

```
        if (ch= =2)    {
              p= Prepair_Paper();
              m= Prepair_ Matches ();
              ……
        }
        if (ch= =3)    {
               p= Prepair_Paper();
               t= Prepair_Tobacco();
               ……
        }
  }
```