## 一、单项选择题（本大题共 11 小题，每小题 2 分，共 22 分）

**提示**：在每小题列出的四个备选项中只有一个是符合题目要求的，请将其代码填写在下表中。错选、多选或未选均无分。

1．The reasons that a major OS will evolve over time includes (　　).

(A) Fixes

(B) New services

(C) Hardware upgrades

(D) All of the above

2．SMP has a number of potential advantages over uniprocessor architecture, including the following: (　　)

(A) Performance, availability, incremental growth, and scaling.

(B) Performance, price, incremental growth, and scaling.

(C) Multithreading, availability, ability, and scaling.

(D) Performance, availability, fairness, and multiprogramming.

3．The Process Image element that contains the collection of attributes needed by the O/S to control a particular process is called the (　　).

(A) User Data

(B) System Stack

(C) Process Control Block

(D) Process properties

4．In a multithreaded environment, the following are associated with processes: (　　)

(A) An execution stack and memory reserved for the process

(B) A virtual address space and protected access to processors, other processes, files, and I/O resources

(C) A virtual address space and a saved execution context

(D) A thread execution state and an execution stack

5．Processes that are indirectly aware of each other have a relationship of (　　).

(A) Cooperation by sharing

(B) Competition

(C) Cooperation by communication

(D) None of the above

6．Requiring that a process request all of its required resources at one time and blocking the process until all requests can be granted simultaneously can destroy the condition (　　) to prevent deadlock.

(A) Mutual exclusive

(B) No preemption

(C) Hold and wait

(D) Circular wait

7．The technique that the OS shifts the processes from time to time so that they are contiguous and so that all of the free memory is together in one block is called (　　).

(A) Relocation

(B) Overlaying

(C) Compaction

(D) Dynamic partitioning

8．The key difference between simple paging and virtual paging is (　　).

(A) Whether all the pages of a process must be in main memory for process to run, unless overlays are used

(B) Whether a page table is used for a process

(C) Whether there is a present bit in a page table entry

(D) Whether there is a modify bit in a page table entry

9．The (　　) determines which process, among ready processes, is selected next for execution.

(A) Selection function

(B) Load policy

(C) Enforcement of priority

(D) Decision mode

10．The objective that handles all devices in a uniform manner is (　　).

(A) Efficiency

(B) Convenience

(C) Generality

(D) None of the above

11．In choosing a file organization, several criteria are important: (　　)

(A) Short access time, ease of update, economy of storage, simple maintenance, and reliability.

(B) Scalability, ease of update, economy of storage, simple maintenance, and reliability

(C) Scalability, ease of update, capacity of storage, simple maintenance, and reliability

(D) Shor access time, ease of update, capacity of storage, simple maintenance, and reliability

## 二、名词解释题（本大题共 5 小题，每小题 3 分，共 15 分）

**提示**：解释每小题所给名词的含义，若解释正确则给分，若解释错误则无分，若解释不准确或不全面，则酌情扣分。

1．Predictability

2．Relocation

3．Virtual Memory

4．Multiprogramming

5．Overlaying

## 三、简答题（本大题共 5 小题，每小题 5 分，共 25 分）

1．Describe the general elements that maybe included in PTE when designing a virtual paging system

2．In virtual memory environment, what are the advantages that only portion of pieces of a process need be in main memory for the process to run?

3．What are the advantages and disadvantages of ULTs compared to KLTs?

4．List the reasons for process suspension.

5．List and briefly define three techniques for I/O operations.

## 四、问答题（本大题共 3 小题，共 38 分）

1．The following figure shows a mutual exclusion protocol based on the use of an exchange instruction: （共 11 分）

```
1       void compare_and_swap (int * word, int testval, int newval)
2       {
3           int oldval;
4           oldval = *word;
5           if (oldval == testval) *word = newval;
6           return oldval;
7       }
8
9       int const n = /* number of processes */
10      int bolt;
11      void p (int i)
12      {
13          while (true)
14          {
15              while (compare_and_swap(bolt, 0, 1) == 1);
16              /* critical section */
17              bolt = 0;
18              /* remainder */;
```

```
19              }
20          }
21
22          void main()
23          {
24              bolt = 0;
25              parbegin (p(1), p(2), … , p(n));
26          }
27
```

Answer the following questions:

(A) Can the "while (compare_and_swap(bolt, 0, 1) == 1);" in line 15 be replaced with "while (bolt == 1); bolt = 1;" ? Why? (4 分)

(B) What are the serious disadvantages of this implementation of mutual exclusion? (6 分)

2．There are 4 processes: P1, P2, P3, P4, and 5 types of resources: A, B, C, D, E. The current resource allocation state as followed: （共 13 分）

| | Claim | | | | | Allocation | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | A | B | C | D | E |
| P1 | 8 | 5 | 5 | 4 | 4 | 3 | 2 | 3 | 3 | 2 |
| P2 | 3 | 4 | 2 | 3 | 7 | 2 | 3 | 1 | 2 | 2 |
| P3 | 4 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 1 |
| P4 | 2 | 2 | 4 | 5 | 4 | 2 | 1 | 3 | 3 | 1 |

| Available | | | | |
|---|---|---|---|---|
| A | B | C | D | E |
| 3 | 3 | 4 | 2 | 1 |

Please answer the following questions by Banker's Algorithm.

(A) The current stats are safe state? (2 分)

Please provide the reasons and steps. (5 分)

(B) If process P2 make a request {1, 1, 1, 1, 0}, the OS should accept it? (2 分)

Why? (4 分)

3．Suppose that the following processes arrive for execution at the times indicated, each process

will run the listed amount of time. (共 15 分)

| Process | Arrival Time | Service Time |
|---|---|---|
| P1 | 0 | 5 |
| P2 | 2 | 6 |
| P3 | 5 | 4 |
| P4 | 8 | 3 |

(A) Draw Gantt charts that illustrate the execution of these processes using first-come-first served (FCFS), round-robin (RR), shortest process next (SPN), Shortest remaining time (SRT) and Highest response ratio next (HRRN). (每种调度算法 2 分，共 10 分)

(B) Calculate Turnaround time (Tr) and Tr/Ts of each process for each of the scheduling algorithm. (每种调度算法 1 分，共 5 分)