一、選擇題 (40%，每題 4%)

(C) 1.　Which of the following would lead you to believe that a given system is an SMP-type system?
A)　Each processor is assigned a specific task.
B)　There is a boss–worker relationship between the processors.
C)　Each processor performs all tasks within the operating system.
D)　None of the above

(D) 2.　A ____ can be used to prevent a user program from never returning control to the operating system.
A)　portal　　B)　program counter　　C)　firewall　D)　timer

(B) 3.　Two important design issues for cache memory are ____.
A)　speed and volatility
B)　size and replacement policy
C)　power consumption and reusability
D)　size and access privileges

(C) 4.　What statement concerning privileged instructions is considered false?
A) They may cause harm to the system.
B) They can only be executed in kernel mode.
C) They cannot be attempted from user mode.
D) They are used to manage interrupts.

(D) 5.　The two separate modes of operating in a system are
A) supervisor mode and system mode
B) kernel mode and privileged mode
C) physical mode and logical mode
D) user mode and kernel mode

(B) 6.　If a program terminates abnormally, a dump of memory may be examined by a ____ to determine the cause of the problem.
A)　module　B)　debugger　　C)　shell　　D)　control card

(B) 7.　Policy ____.
A)　determines how to do something
B)　determines what will be done
C)　is not likely to change across places

D)   is not likely to change over time

(D) 8.   A microkernel is a kernel _____.
A)   containing many components that are optimized to reduce resident memory size
B)   that is compressed before loading in order to reduce its resident memory size
C)   that is compiled to produce the smallest size possible when stored to disk
D)   that is stripped of all nonessential components

(C) 9.   To the SYSGEN program of an operating system, the least useful piece of information is _____.
A)   the CPU being used
B)   amount of memory available
C)   what applications to install
D)   operating-system options such as buffer sizes or CPU scheduling algorithms

(B) 10.   _____ provide(s) an interface to the services provided by an operating system.
A) Shared memory   B) System calls   C) Simulators   D) Communication

二、問答題 (60%)

11. What is the purpose of interrupts? What are the differences between a trap and an interrupt? (4% 4%)

The purpose of interrupts lies in handling events that requires immediate attention such as I/O completion, hardware errors, and timer expiration.
An interrupt is an event triggered by external hardware or devices while a trap is an event caused by the execution of an instruction within a program like divide-by-zero errors or invalid memory access.

12. Describe three general methods for passing parameters to the operating system. (6%)

● Registers: Some parameters can be passed to the operating system through designated CPU registers. The operating system can access these registers directly to retrieve the required information.
● Stack: Parameters can be pushed onto the stack by the calling program before invoking the system call. The operating system can then access these parameters by popping them off the stack.
● Memory: Parameters can be stored in a predefined memory location or data structure specified by the calling program. The operating system knows where to fond these parameters based on the agree-upon convention between the

13. What are the two models of interprocess communication? What are the strengths and weaknesses of the two approaches? (4% 4%)

The two models of interprocess communication are 'Message Passing' and 'Shared Memory'.

'Message passing' provides better protection between processes since communication occurs through controlled mechanisms. It is suitable for distributed systems. But it takes more time to copy and synchronize leading to higher latency.

'Shared Memory' offers higher performance because processes can communicate without kernel intervention. But it requires careful synchronization to avoid conditions and data inconsistency.

14. Describe the differences among short-term, medium-term, and long-term scheduling. (6%)

● Short-term: select which processes to execute next on the CPU from the ready queue.

● Medium-term: select which processes to be swapped in and out of RAM and the disk.

● Long-term: select which processes to admit into the system and allocate resources to.

15.Including the initial parent process, how many processes are created by the program shown in Figure 3.32? (6%)

```c
#include <stdio.h>
#include <unistd.h>

int main()
{
    int i;

    for (i = 0; i < 4; i++)
        fork();

    return 0;
}
```

Figure 3.32 How many processes are created?

2^4 = 16

(B)(C) 16. Which of the following components of program state are shared across threads in a multithreaded process? (8%)

a. Register values

b. Heap memory

c. Global variables

d. Stack memory

17. Consider the following code segment:

```
pid_t pid;

pid = fork();
if (pid == 0) { /* child process */
      fork();
      thread_create( . . .);
}
fork();
```

6 a. How many processes are created? (include main process)   (5%)

2 b. How many threads are created? (5%)

(B)(D) 18. Which of the following scheduling algorithms could result in starvation? (8%)

a. First-come, first-served

b. Shortest job first

c. Round robin

d. Priority