

Department of Computer Science and Engineering
National Sun Yat-sen University
First Semester of 2026 PhD Qualifying Exam

Subject : Operating Systems

1. Processes and Synchronization (20%):

- (1) Both multiprogramming and time-sharing are two key features of modern computers. What are their objectives? (4%)
- (2) Give three reasons why a parent process terminates the execution of its child processes. (6%)
- (3) Given the following data items shared by two processes P_i and P_j :

```
int turn;  
boolean flag[2];
```

where `turn` indicates whose turn it is to enter the critical section and the `flag` array indicates if a process is ready to enter the critical section. Then, please show the pseudocode for the Peterson's solution for both processes. (10%)

2. Memory (20%):

- (1) In dynamic loading, routines are not loaded until they are called. Please give the five steps involved in dynamic loading. (10%)
- (2) Give five benefits of using virtual memory. (10%)

3. Mass Storage (20%):

- (1) Explain seek time, rotational latency, and device bandwidth for HDD devices. (6%)
- (2) What is write amplification in NVM devices? (4%)
- (3) What are the four steps involved in the boot process of Windows systems? (8%)
- (4) What is a Fibre channel? (2%)

4. I/O Subsystem (20%):

- (1) Please explain how incremental, physical, and logical dump work. (9%)
- (2) What is a daisy chain? (3%)
- (3) What are the four typical device-control registers? What are their purposes? (8%)

5. File System (20%):

- (1) What is the difference between mandatory and advisory file-locking mechanisms? (4%)
- (2) Explain three common access methods for files. (6%)
- (3) Explain the two naming notions for distributed file systems. (4%)
- (4) Give three common naming schemes for files in distributed systems. (6%)