

資格考試科目：高等作業系統

Instructions: There are **three** questions which count 100 points in total. Each question may have several sub-questions. Please read the questions thoroughly before answering.

1. Process Management (35 points): the following questions assume that a single process computer with NUMA architecture.
 - A. (15 points) Please describe the sequence of starting a user process from program files, which should include storage subsystems, system software, memory subsystems, and process subsystems.
 - B. (10 points) Please describe the sequence of preempting a running process, whose state is changed from running to ready. The sequence should include process scheduling, memory paging, storage, and processor.
 - C. (10 points) Please compare the context switch mechanisms for processes, user-level threads, and kernel-level threads.

2. (30 points) Memory management:
 - A. (10 points) Please describe the cause of page faults and how the page faults are handled in operating systems.
 - B. (10 points) If LRU page replacement is used with three page frames and eight pages, how many page faults will occur with the reference string 27430237 if the four frames are initially empty?
 - C. (10 points) What is the worst case page reference sequence in the above question for LRU? (Hint: you should re-order the reference string so that the number of page replacement is the maximum.)

3. (35 points) The following questions are related to distributed file systems.
 - A. (10 points) Please describe the major difference between centralized and distributed file systems, in terms of system architecture, scalability, reliability, and robustness.
 - B. (10 points) Please describe the difference between replicated files and cached files on networked file systems.
 - C. (15 points) Please describe the difference between stateful and stateless servers.