

科目：作業系統(A)

日期：101 年 1 月 17 日 第 1 頁 共 1 頁

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* 請將答案依題號順序寫入答案卷

答題時字跡需工整，否則不予計分。Write your answers legibly; otherwise you will get zero score.

*** Make sure your English writing is effective. Otherwise, use Chinese.

1. [10 points] One of the new features of the ext4 file system is delayed allocation, which delays the assignment of disk block numbers to data (in page cache) until the data are going to be written to the disk. Explain why this technique can reduce file fragmentation.
2. [10 points] Journaling is a technique that protects file systems from being corrupted by power interruptions. However, this feature comes with performance costs. Describe a circumstance in which journaling can severely degrade file-accessing performance.
3. [10 points] LRU (least-recently used) and LFU (least-frequently used) are two cache replacement algorithms. Pick up the better choices for the following cases, and explain why your choices are.
 - (a) Reference to hot data (frequently accessed data) is interleaved with sequential access.
 - (b) There is little sequential access, but temporal localities of reference change from time to time.
4. [10 points] Consider a new storage device that has the following properties: 1) all disk blocks are partitioned into groups, 2) read is much faster than write, and 3) random access to disk blocks of the same group is fast but cross-group access is slow. Suggest how the disk cache and the disk scheduler can be tailored for this new storage device.
5. [10 points] A sandbox is a security mechanism that protects the operating system and other applications from un-trusted software. Explain the basic concepts of a sandbox.

◎ 請用深黑色鋼筆或原子筆出題

命題老師簽名：

國立交通大學試題紙

一百學年度第一次
博士班資格考

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1. [10 points] There are different approaches to structuring an operating system. Explain in details how the following three approaches work and compare their advantages and disadvantages: 1) Layered approach, 2) Microkernel approach, and 3) Modules approach.
2. [10 points] Interprocess communication using shared memory requires communicating processes to establish a region of shared memory. Use the following shared-memory-related POSIX system calls to establish a region of shared memory for two communicating processes: 1) `shmid = shmget(key, size, flags)` and 2) `regionaddr = shmat(shmid, shmaddr, flags)`. You should write the pseudo code for each of the two processes to illustrate how to use these `shmXXX()` system calls to share information between them.
3. [10 points] Explain how the “thread pool” design works and its two important advantages compared with the design in which a separate thread is created for each arriving service request.
4. [10 points] Regarding multi-processor scheduling, the “process affinity” and “load balancing” issues must be considered. Explain in details how each of these two designs works and their respective advantages. Also explain why these two designs may conflict with each other and as a result their respective advantages may be reduced.
5. [10 points] For a deadlock situation to arise, four conditions must hold simultaneously. List and explain in details these four conditions. For each condition, find a way to exploit it to prevent deadlock situations from happening.

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命題老師簽名：