

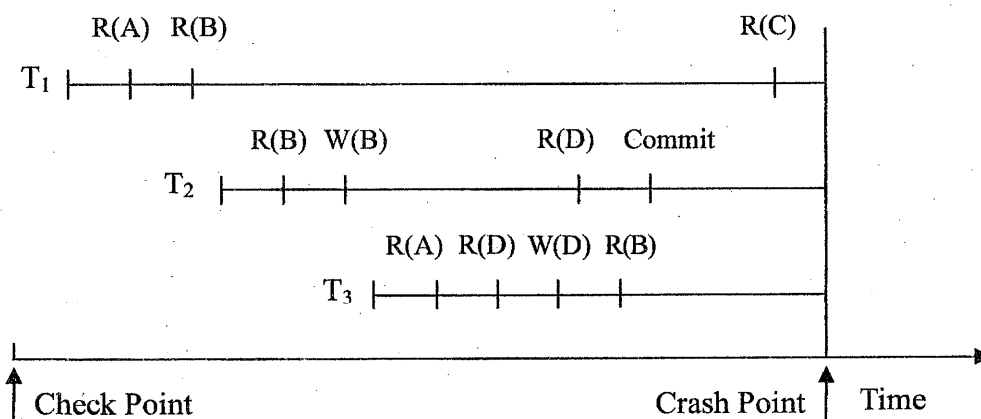


## 注意事項：

1. 答案依序書寫於答案卷上，不必抄題。
2. 答案卷不可書寫任何可辨別個人姓名或特殊標記，違者不予計算。
3. 請於試題紙上填寫准考證號碼，繳卷時「試題」、「答案卷」一併繳回。

## Please answer the following questions (10 points each.)

1. Suppose we have a demand-paged memory. The page table is held in registers. It takes 4 milliseconds to service a page fault if an empty page is available or the replaced page is not modified and 5 milliseconds if the replaced page is modified. Memory access time is 100 nanoseconds. Assume that the page to be replaced is modified 60 percent of the time. What is the maximum acceptable page-fault rate for an effective access time of no more than 300 nanoseconds?( Please show your calculation process)
2. What are the benefits and detriments of each of the following? Consider both the systems and the programmers' levels.
  - A. Symmetric and asymmetric communication
  - B. Automatic and explicit buffering
  - C. Send by copy and send by reference
  - D. Fixed-sized and variable-sized messages
3. Suppose there exist a sender A and a receiver B in different LANs which are connected by a router R. A has IP address IP-A and MAC address MAC-A while B has IP address IP-B and MAC address MAC-B. Please show how A transmits data to B with different addresses mentioned above.
4. In error-correction schemes, to provide more reliability than a single parity bit can give, an error-detecting coding scheme uses one parity bit for checking all the odd numbered bits and a second parity bit for all the even numbered bits. Will this scheme detect all single errors, double errors, and triple errors? Please explain your answer.
5. Given a transaction log shown as follows, where R( ) and W( ) mean read and write operations on database objects, respectively. An update scheme with check-point is applied for crash recovery. Please explain and give the reasons why this log could be recovered or not.



6. Please explain the reasons why BCNF design is not usually adopted in designing a relational database schema.
7. PUSH 1,2,3,4,5,6,7 on the stack such that the contents can be POP at anytime.
  - (1) The following three strings were generated based on the above rules. Write the PUSH and POP sequence for each string: 7654321, 1234567, 1265437
  - (2) The following three strings cannot be generated based on the above rules. Find a rule that can determine that the strings cannot be generated.  
7654123, 1276345, 1265347
8. Use C to write a recursive program for determining if two given binary trees are equal.
9. The square of a matrix  $A$  is its product with itself,  $AA$ . Show that five multiplications are sufficient to compute the square of a matrix.
10. Give a number sequence of length 8 which is a worst case for quick sort. (You need to describe your version of quick sort, and then describe a worst case for your algorithm. Finally, give the reason why it is a worst case.)