國立交通大學 94 學年度碩士班入學考試試題

科目名稱：計算機概論（0391）　考試日期：94 年 4 月 16 日　第 2 節
系所班別：資訊管理研究所　　組別：甲組　　　第 1 頁,共 3 頁
＊作答前,請先核對試題、答案卷（試卷）與准考證上之所組別與考試科目是否相符!!

1. **(8%) Dining-Philosophers Problem**
Consider five philosophers who spend their lives thinking and eating. The philosophers share a common circular table surrounded by five chairs, each belonging to one philosopher. In the center of the table is a bowl of rice, and the table is laid with five single chopsticks. When a philosopher thinks, she does not interact with her colleagues. From time to time, a philosopher gets hungry and tries to pick up the two chopsticks that are closest to her (the chopsticks that are between her and her left and right neighbors). A philosopher may pick up only one chopstick at a time. Obviously, she cannot pick up a chopstick that is already in the hand of a neighbor. When a hungry philosopher has both her chopsticks at the same time, she eats without releasing her chopsticks. When she is finished eating, she puts down both of her chopsticks and starts thinking again. Propose a deadlock and starvation free solution using semaphores for the dining-philosophers problem (Please explain why your solution is deadlock and starvation free).

2. **(12%) CPU Scheduling**
Consider the following set of processes, with the length of the CPU-burst time given in milliseconds. The processes are assumed to have arrived in the order P1, P2, P3, P4, P5, all at time 0

Process	Burst Time	Priority
P1	9	3
P2	1	1
P3	3	3
P4	2	4
P5	6	2

   (1) Draw three Gantt charts illustrating the execution of these processes using SJF, a non-preemptive priority (a smaller priority number implies a higher priority), and RR (quantum = 1) scheduling.
   (2) What is the waiting time of each process for each of the scheduling algorithms in part (1)?

3. **(5%) Disk Allocation**
Consider the organization of a UNIX file as represented by the Inode. Assume that there are 10 direct block pointers, and a singly, doubly, and triply indirect pointer in each Inode. Further, assume that the system block size and the disk sector size are both 4K. If the disk block pointer is 4 bytes, then what is the maximum file size supported by this system?

4. **(8%) Algorithm Analysis**
請根據快速排序法(Quick Sort)，將 25, 13, 10, 69, 50, 21, 48 加以排序(請寫出詳細排序過程)。又，快速排序法在何種狀況下有最佳的執行時間？何種狀況下的執行時間最差？其在最佳及最差狀況下的執行時間數量級(Order of Magnitude)各為何(假設需將 N 個數字加以排序)？

5. (a) What is grid computing?(5%)
   (b) Give the potential economic activities that could be implied by grid computing? (7%)

6. Consider a sequence of m operations $O_1, O_2, ..., O_m$ on a stack. Each operation O_i, $1 \le i \le m$, consists of n_i pops and one push, $0 \le n_i \le$ stack_size_before_this_operation. Assume that each push or each pop takes one time unit. Show that the average time over the m operations is no more than two. (5%)

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7. Set Covering: Given a finite set S of integers and a collections of subsets $A = \{S_1, S_2, ..., S_k\}$ with each $S_i \subseteq S$, $1 \le i \le k$, we want to find the minimum number of elements in A such that the union of these elements equals S. Give an application that can be modeled using the Set Covering problem. (8%)

8. Information divide (數位落差) is one of the problems caused by the advances of information technology. Usually our focus is set on the information divide problems concerning education in our society. Actually, information divide also exists among different industry sectors as well as among different countries. Give the potential information divide problems in the companies along a supply chain. Provide your solutions to resolve the problems. (8%)

9-15 為選擇題，每題二分：

9. Which of the following is a characteristic of ADSL? (Choose one)
   A. It is designed to deliver more bandwidth downstream than upstream.
   B. It is designed to deliver more bandwidth upstream than downstream.
   C. The upstream rates range from 1.5 to 9 Mbps.
   D. The downstream rates range from 16 to 640 Kbps.

10. What are two characteristics of DSL? (Choose two)
    A. uses fiber for local loop transmission
    B. uses copper for local loop transmission
    C. uses Layer 2 technology
    D. uses Layer 1 technology

11. Which critical functions are provided by VPNs?(Choose three)
    A. confidentiality of information
    B. integrity of data
    C. authorization of users
    D. authentication of users
    E. WAN management

12. Which algorithm methods provide asymmetric encryption?(Choose two)
    A. Secret Key
    B. DES
    C. RSA
    D. 3DES
    E. Public Key
    F. AES

13. In which data over ADSL architecture is the user PC required to run client software? (Choose one)
    A. PPPoA
    B. PPPoE
    C. CAP
    D. RFC 1483/2684

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14. What is the result of the AND boolean operation between address 198.47.47.83 and mask 255.255.255.192? (Choose one)
    A. 198.47.0.0
    B. 198.47.47.0
    C. 198.47.47.64
    D. 198.47.47.32

15. What is the maximum number of bits that can be borrowed from the host potion of a class C network to create subnets? (Choose one)
    A. 2
    B. 4
    C. 6
    D. 8

16. According to IEEE single precision floating-point format of 32-bits, $F = (-1)^S\, 1.f\, 2^{E-127}$, what are the largest and smallest positive numbers? (8%) (please show all your works, no points if you only give the final values)

17. Show that approximately $3.3n$ bits are needed to represented an n-digit decimal number. (5%) (Please use the following information for your proof: ln2 = 0.693, ln3 = 1.0986, ln10= 2.3)

18. What is a tri-state gate or device and why is it important in computers? (3%)

19. High end graphics video data transfer over a PCI bus. Assume that a high end graphics card is going to designed to connect to the PCI bus. The specification needs to define the amount of memory on the graphics card and the percent utilization of the PCI bus. (Note: use 1 kB=1024 B, 1 MB = 1024 kB, and 1 GB = 1024 MB)

    Assume that the high end graphics card is going to support a 1280 x 960 pixel display. For graphics, the card provides 4 pixel memory buffers, each supporting 3-byte RGB color. How much RAM is required on the graphics card? (4%)