

1. Is *virtual machine* hardware or software? Draw a figure to indicate the its relationship with physical hardware, operating systems, and application processes. (10%)
2. As we know the shortest-job-first scheduling is the best scheduling method in terms of the average waiting time. Please answer the following questions: a) what is the difficulty it suffers, b) how to solve the difficulty, and c) under which CPU burst pattern we can get better achievement based on the method on b). (10%)
3. Determine the following statements *true* or *false* and briefly explain your answer. (10%)
  - a) Two tasks are executed atomically means that they are executed in sequential.
  - b) Two tasks are executed concurrently *does not* mean that they are executed in parallel.
  - c) The system provides multiprogramming has the same meaning with that the system provides multiprocessing.
  - d) Two processes are executed synchronously means that they are executed in the same begin time.
4. Describe why LRU (Least Recently Used) page-replacement algorithm is a practical alternative approach to the optimal algorithm. In other words, why the optimal algorithm is not practical and why LRU is an alternative one to it. (10%)
5. The *disk cache* and *RAID disk* are two of the methods to improve the performance of a file system. Explain the reason and their differences. (10%)
6.
  - a) What is *firewall*? Why it is important in terms of Internet services.
  - b) Compare circuit and packet switchings. (10%)
7. Show that the following grammar
$$\begin{aligned} S &\rightarrow Aa \mid bAc \mid Bc \mid bBa \\ A &\rightarrow d \\ B &\rightarrow d \end{aligned}$$
is LR(1) but not LALR(1). (10%)

(背面仍有題目,請繼續作答)

8. Let synthesized attribute *val* give the value of the binary number generated by *S* in the following grammar. For example, on input 101.101,  $S.val = 5.625$

$$S \rightarrow L.L \mid L$$
$$L \rightarrow LB \mid B$$
$$B \rightarrow 0 \mid 1$$

Please use synthesized attributes to determine  $S.val$ . (10%)

(Hint: the number of binary digit *L* is needed in determining  $S.val$ .)

9. In C, the "for" statement has the following form:

$$\text{for} (e1 ; e2 ; e3) \text{ stmt}$$

Taking its meaning to be

$$e1 ;$$
$$\text{while} (e2) \{$$
$$\text{stmt};$$
$$e3 ;$$
$$\}$$

(a) Please translate its meaning into three address code. (10%)

(b) Please construct a syntax-directed definition to translate C-style for statements into three-address code. (10%)