國立臺灣科技大學
九十學年度碩士班招生考試試題

系所組別： 資訊工程系
科　目： 作業系統

1. List three main purposes of an operating system? (15%)

2. Can a system detect that some of its processes are starving? If you answer "yes", explain how it can. If you answer "no", explain how the system can deal with the starvation problem. (8%)

3. Consider the following "solution" to the readers/writers problem using the programming construct of "conditional regions". Assume that rc = 0 initially and that any number of reader and writer processes may run concurrently.

```
reader:  begin
             region  v  do
                 rc := rc + 1;

             do_the_reading; (this part is NOT in the region.)

             region  v  do
                 rc := rc – 1;
         end;

writer:  begin
             region  v  when rc = 0  do
                 do_the_writing; (this IS within the region.)
         end;
```

a) Does this solution satisfy the general requirements of the readers/writers problem? (Does it allow simultaneous reading but ensure exclusive writing?) Give reasons for your answer. (9%)
b) Does this solution avoid starvation of readers? Explain. (9%)
c) Does this solution avoid starvation of writers? Explain. (9%)

4. A disk is single interleaved. It has eight sectors of 512 bytes per track, and a rotation rate of 300 rpm. How long does it take to read all the sectors of a track in order, assuming the arm is already correctly positioned, and 1/2 rotation is needed to get sector 0 under the head? What is the data rate? Now repeat the problem for a noninterleaved disk with the same characteristics. How much does the data rate degrade due to interleaving? (15 %)

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5. A bit map terminal contains 1200 by 800 pels. To scroll a window, the CPU must move all the lines of text upwards by copying their bits from one part of the video RAM to another. If a particular window is 66 lines high by 80 characters wide, and a character's box is 8 pels wide by 12 pels high, how long does it take to scroll the whole window at a copying rate of 500 nsec per byte? If all lines are 80 characters long, what is the equivalent baud rate of the terminal? Putting a character on the screen takes 50 microsec. Now compute the baud rate for the same terminal in color, with 4 bits/pel. (15 %)

6. If LRU page replacement is used with four page frames and 12 pages, how many page faults will occur with the reference string 60172327103 if the 4 frames are initially empty? (10 %)

7. It has been observed that the number of instructions executed between page faults is directly proportional to the number of page frames allocated to a program. If the available memory is doubled, the mean interval between page faults is also doubled. Suppose that a normal instruction takes 1 microsec, but if a page fault occurs, it takes 2001 microsec. If a program takes 60 sec to run, during which time it gets 10,000 page faults, how long would it take to run if twice as much memory were available? (10%)