國立臺北科技大學

九十三學年度資訊工程系碩士班入學考試

作業系統試題

填准考證號碼

注意事項：

1. 本試題共九題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在答案卷之答案欄內，否則不予計分。

1. Explain each of the following terms. (4% each)
   (a) N-step-SCAN policy
   (b) Fail-soft operation
   (c) Data striping
   (d) Cryptography
   (e) Eavesdropper

2. Measurements of a certain system have shown that the average process runs for T time units before blocking on I/O. A process switch costs an overhead of S time units. For round-robin scheduling with quantum Q, give a formula for the CPU efficiency for each of the following: (2% each)
   (a) Q = infinity
   (b) Q > T
   (c) S < Q < T
   (d) Q = S
   (e) Q nearly 0

3. Answer the following questions.
   (a) Explain the differences between the user/kernel threads? Under what circumstance is one type better than the other? (5%)
   (b) Briefly describe three common multithreading models supporting the user and kernel threads. Describe the benefits and drawbacks of each model. (5%)

4. Briefly describe the following four approaches for multiprocessor thread scheduling and processor assignment: (1) Load sharing; (2) Gang scheduling; (3) Dedicated processor assignment; and (4) Dynamic scheduling. (10%)

5. In the following code, three processes produce outputs and synchronize using two semaphores "L" and "R." Here, the semaphore operations, denoted using "P" and "V," represent the "wait" and "signal" operations respectively.

```
semaphore L = 3, R = 0;      /* setup the initial values for L and R */
```

```
/* process 1 */          /* process 2 */          /* process 3 */
L1:                      L2:                      L3:
    P(L);                    P(R);                    P(R);
    print("C");              print("A");              print("D");
    V(R);                    print("B");              goto L3;
    goto L1;                 V(R);
                             goto L2;
```

   (a) How many D's are printed when this set of processes terminates? (2%)
   (b) What is the smallest number of A's that might be printed when this set of processes terminates? (2%)
   (c) Is CABABDDCABCABD a possible output sequence when this set of processes terminates? (2%)
   (d) Is CABACDBCABDD a possible output sequence when this set of processes terminates? (2%)
   (e) Are there initial values that can be given to the semaphores L and R so that the output sequence can be ABCDD when this set of processes terminates? (2%)

注意：背面尚有試題

6. Consider the following software approach to solve the critical-section problem for four processes with process id 0, 1, 2, and 3. The common data structures `num[i]` and `testing[i]`, $0 \leqq i \leqq 3$, are global arrays of integer and boolean types, respectively. Initially, `num[i]` and `testing[i]` are initialized to 0 and FALSE for $0 \leqq i \leqq 3$.

```
Process i;
1.  testing[i] = TRUE;
2.  num[i] = 1 + max(num[0], num[1], num[2], num[3]);
3.  testing[i] = FALSE;
4.  for (j=0; j<4; j++) {
5.      while(testing[j]);
6.      while((num[j] != 0) && ((num[j], j) < (num[i], i)));
7.  }                              /* (a, b) < (c, d) if a < c or if a==c and b < d */
8.  critical section
9.  num[i] = 0;
```

(a) If the four processes execute at the same rate as much as possible, in what order will the four processes enter the critical section? For example, all processes will begin and finish executing Line 2 at the same time. Explain. (2%)

(b) What would be the effect of omitting Line 5? Explain. (4%)

(c) How does the algorithm guarantee mutual exclusion? (4%)

7. Compare and contrast working set model and page-fault frequency model for page replacement. (10%)

8. Describe the scheme of inverted page table for address translation. (10%)

9. Some systems implement file sharing by allowing several users to read a single copy of a file simultaneously. Others provide a copy of the shared file to each user. Discuss the relative merits of each approach. (10%)