

國立臺灣科技大學
九十一學年度博士班招生考試試題

系所組別：資訊工程系
科目：計算機系統

總分 100 分

1. Consider a system with the following time-measured utilizations:

CPU utilization 13%

Disk utilization 97%

Which (if any) of the following will (probably) improve CPU utilization? Explain your answer. (10%)

- a. Install a faster CPU
 - b. Increase the degree of multiprogramming
 - c. Decrease the degree of multiprogramming
 - d. Install more main memory
 - e. Install a fast hard disk
2. Brief the differences among semaphore, monitor, and message passing for process synchronization. (10%)
3. Which of the following programming techniques and structures are "good" for a demand-paged environment? Which are "not good"? Explain your answers. (10%)
- a. Hashed symbol table
 - b. Sequential search
 - c. Binary search
 - d. Array
 - e. Linked List
4. (a) What is a von Neumann architecture? (5%)
(b) Describe the machine cycle in a von Neumann architecture. (10%)
(c) What is von Neumann bottleneck? (5%)



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5. Find the time complexity of the following functions.

(a) (10%)

```
for i = 0 to n do
  begin
    j = i;
    while j ≠ 0 do j = j / 2;
  end
```

(b) (10%)

```
function Euclid (m, n)
  while m > 0 do
  begin
    t = n mod m;
    n = m;
    m = t;
  end
  return n
```

6. Please answer the following questions briefly.

- (a) If any one NP-Complete problem can be solved in polynomial time, then all the NP problems can be solved in polynomial time? (10%)
- (b) We use a computer program to “deliver students” in the Joint Entrance Examination of Colleges and Universities, i.e., the program decides which student goes to which department. Is the algorithm “student-optimal” or department-optimal”? (10%)
- (c) Is it possible to multiply two $n \times n$ matrices in a time $O(n^{2.81})$. (10%)

