# 國 立 臺 北 科 技 大 學

九十七學年第二學期電機系博士班資格考試

計算機概論(大學部)試題(公告用)

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注意事項：

1. 本試題共【10】題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在試卷答案欄內，否則不予計分。
4. 考試時間：二小時。

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1. (a) List the following classes in <u>decreasing order of efficiency</u>. (5%)

    $\Theta(n)$　　$\Theta(\lg n)$　$\Theta(n^4)$　$\Theta(n\lg n)$　$\Theta(n!)$　　$\Theta(2^n)$

   (b) Is a polynomial solution to a problem always better than an exponential solution? Explain your answer. (5%)

2. List the major events that take place when a process is interrupted (10%)

3. Derive the truth table of a 4×1 multiplexer circuit, and draw its schematic diagram using logic gates. (10%)

4. (a) Summarize the principles of public-key encryption. (5%)

   (b) Is it possible to use the technique of public/private key to generate and read digital signature? Explain your answer. (5%)

5. In an object-oriented programming environment,

   (a) What is the difference between a user-defined data type and a primitive data type? Exemplify your answer. (5%)

   (b) What is the difference between an abstract data type and a user-defined data type? Exemplify your answer. (5%)

6. Given the following network where the weights represent the time delays across a link:
   (a) Find a shortest path from node A to G and give its overall delay. (6%)
   (b) For a network with N nodes, what are the time complexities of finding a shortest path using "brute force" algorithm and using Dijkstra's shortest path algorithm, respectively? (4%)
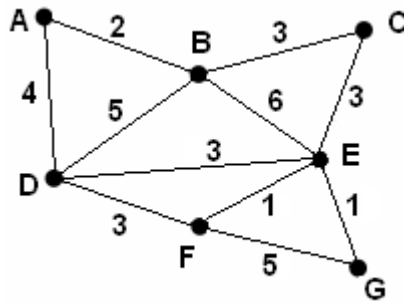
7. HTML, PHP, and SQL are special-purpose languages and have been widely used in web-based businesses. Answer the following questions briefly:
   (a) What does SQL stand for? (2%)
   (b) What is the usage of SQL? (2%)
   (c) Describe the relationship between PHP and HTML. (2%)
   (d) Describe the differences between static and dynamic Web pages, and (2%)
   (e) Describe the relationship between PHP and SQL. (2%)

8. (a) Apply the value 3 to the following procedure, in which N is an integer, and record the values that are printed. (5%)

```
procedure MysteryDigit (N)
if (N > 0) then (print the value of N and
                 apply the value N – 2 to the procedure MysteryDigit)
print the value of N + 1
```

   (b) Rewrite the procedure given in (a) into a complete function using C or C++ language. (5%)

9. Explain the following terms briefly:
   (a) Von Neumann bottleneck (3%)
   (b) MIMD parallel processing (3%)
   (c) Cluster computing (2%)
   (d) Grid computing (2%)

10. A compiler translates JAVA assignment statement into assembly language code (as shown below). Is this translation right or wrong? Explain your answer. (10%)

// JAVA code
A = (B + C) - (D + E);

→

```
// Translated assembly language code
-- Compute the term (B+C)
LOAD B    -- Register R holds the value of B
ADD C     -- Now it holds the result (B+C)
STORE B   -- Put the result temporarily in B
-- Next compute the term (D+E)
LOAD D    -- Register R holds the value of D
ADD E     -- Now it holds the result (D+E)
STORE D   -- Put the result temporarily in D
-- Finally, subtract the two terms and
--            store the result in A
LOAD B    -- This holds the value of (B+C)
SUBTRACT D -- This is (B+C) - (D+E)
STORE A   -- Put the result in A
```