



國立雲林科技大學

九十二學年度研究所碩士班入學考試試題

系所：設計運算所

科目：計算機概論(甲)

說明：本試題共有六大題，請依序並標明題號，詳答於答案卷上，可以不用抄題。

- 一、實體關係圖 (entity-relationship diagram) 可以用來表示系統處理的資訊項目 (實體) 與資訊之間的關係。請以矩形表示實體、菱形表示關係，繪製一實體關係圖並詳加闡釋供應商、訂單與消費者間的多種結構 (如一對一、一對多、多對多) 關係。(25%)
- 二、請表達出能儲存下列字母清單 (R、S、T、U、V、W、X、Y 與 Z)，以供未來搜尋的二元樹 (binary trees)。(10%)
- 三、數位內容的創作，經常需使用不同格式的點陣圖檔，請詳加說明 BMP、PICT、TIFF、JPEG、GIF、PNG 等標準格式的特點，並指出與詳述當中哪一些適合用來在網頁上呈現圖形或影像。(15%)
- 四、請說明知識庫(Knowledge Base)與資料庫(Database)之差異何在？(15%)
- 五、試問人工智慧的工具與技術，如何可以用來改善傳統的設計資訊查詢系統？而這個設計資訊查詢系統又如何可以被用來作為設計決策支援系統(Decision Support System)的一部份？(15%)
- 六、名詞解釋：(20%)
 1. 關聯式資料庫 (Relational Database)
 2. Java 虛擬機器 (Java Virtual Machine)
 3. 物件導向程式設計 (Object-Oriented Programming)
 4. 沈浸式虛擬實境 (Immersive VR)



說明：本試題共有五大題，請依序並標明題號，詳答於答案卷上，可以不用抄題。
其中第 1、2 題必須以英文作答，第 3、4 題則可以中文或英文作答。

1. **Define** *Computational Design* on your own point of view. **Select and briefly describe** one design process that, you think, is the most appropriate one in the computational design domain among many design process theories and **design** (you only choose **one** of the following):
 - (a) a *single-family housing plan* for 4 family members (father, mother, son, and daughter),
or
 - (b) a *cellular phone* for young generation, or
 - (c) a *business card* for President of the University**according to the design process you choose. (35%)**

2. Choose only **one** of the following questions to answer: (15%)
 - (a) **Explain** what typology (類型學) is in design and **exemplify** which *design situation* is the most appropriate to apply in design typology.
 - (b) **Explain** what analogy (類推) is in design and **exemplify** which *design situation* is the most appropriate to apply in design analogy.

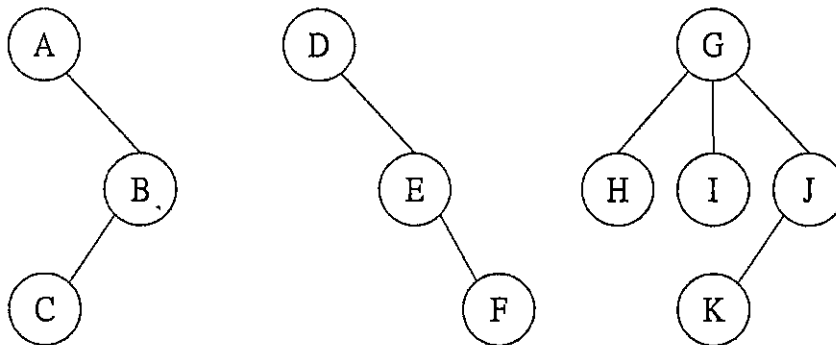
3. “In the world of design problems, a distinction can be made between those that are *well defined* (定義良好) and those that are *ill defined* (定義不良). In the latter category further distinctions can be drawn, resulting in the subclass *wicked problems* (惡性問題).”
(Churchman 1967) **Explain** or **exemplify** the characters of these three design problems.
(15%)

4. Problem-solving behavior can be divided into three subclasses of activity, namely, *problem representation problem* (問題重構問題), *solution generation problem* (解決方案衍生的問題), and *solution evaluation problem* (解決方案評估問題). **Explain** or **exemplify** these three subclasses of activity. (15%)

5. Explain what *first-order predicate logic* (首位述詞邏輯) is; **exemplify** a simple design (draw a sketch) you are familiar and **express** its physical properties by *first-order predicate logic*.
(20%)



- (10 points) Write an algorithm to rewrite an infix expression of tokens as a postfix expression. Write another algorithm to evaluate the postfix expression of tokens. Consider the example expression "69-(25+20)/15" with the tokens "69", "-", "(", "25", "+", "20", ")", "/", and "15". Use this example to illustrate your algorithms. What are the time complexities of your algorithms?
- (15 points) Given the regular expression $(E) ab(ba)^+b^*$, with alphabets $\{a,b\}$.
 - (5 points) Give five example strings of the language $L(E)$.
 - (5 points) Design a finite state transition machine that accepts the same language $L(E)$.
 - (5 points) Design a context-free grammar G with initial symbol S such that language $L(G) = L(E)$.
- (10 points) Write a QuickSort algorithm to sort a list of numbers. Illustrate your algorithm with the sample list 23, 4, 11, 28, 1, 8, 16, 7, 21, 19. What is the time complexity of your algorithm?
- (15 points) File data are commonly compressed as variable-length, binary-character codes in order to save disk space. Huffman coding produces a prefix code with variable length---no codeword is also a prefix of some other codeword. Describe an algorithm to produce Huffman coding. Illustrate your algorithm with the sample inputs: z, y, w, v, x, u, with respective occurrence frequencies 5, 9, 12, 13, 16, 45. What is the time complexity of your algorithm?
- (10 points)請將下列三棵樹的樹林轉變成二元樹。



- (15 points)已知二維陣列的第一個元素是 $A(1, 1)$ ，其 $A(21, 22)$ 的位址是 844， $A(31, 32)$ 的位址是 1204，請問 $A(11, 12)$ 的位址為何？
- (15 points)在一個 Multiprogramming 的計算機系統中，一個 process 可能處於哪些狀態(state)？試繪出所有狀態的關係圖。
- (10 points)若四位元的二進位資料為 1011，請用漢明碼(Hamming Code)將其編碼。



You may answer the following questions in English or Chinese.

1. Try to name five international well-known designers and describe briefly the characteristics of their design works. (25%)
2. Try to name five different design methods and make a succinct description for each of them. (25%)
3. Try to name ten different design fields and describe briefly what their core knowledge are. (25%)
4. Choose five most diverse design fields from your answer to last question, and compare the similarities and dissimilarities among them (e.g.: working process, methods used, outcomes, . . . etc.) . (25%)