國立成功大學

112學年度碩士班招生考試試題

編　號：157

系　所：生物醫學工程學系

科　目：計算機概論

日　期：0206

節　次：第 2 節

備　註：不可使用計算機

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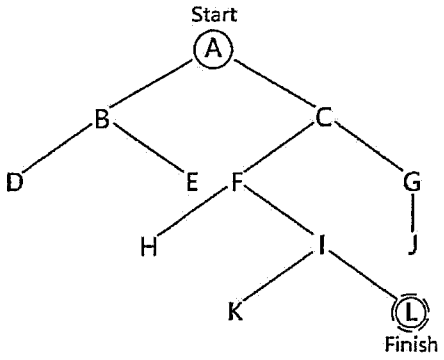
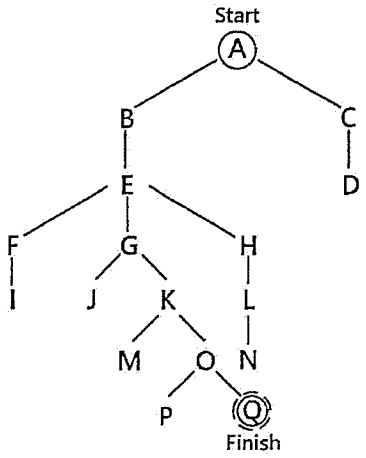
※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. (10%) Draw a tree and show the depth-first search for the problem below.





2. (10%) Show the state diagram of a **Turing Machine** that increments a nonnegative integer represented in binary system, such as the contents of the tape is $(101)_2$, it will be changed to $(110)_2$.

3. (10%) Encrypt the message "NCKU BME" using **Additive Cipher** with key = 20. Ignore the space between words and decrypt the message to get the original plaintext.

4. (10%) Encode the following characters using **Huffman Coding** with the given frequencies:

A (12), B (8), C (10), D (20), E (31), F (14), G (8)

5. (10%) Find the address of the following keys using the **Division Modulo Method** and a file of size 411. If there is a collision, use open addressing to resolve it. Draw a figure to show the position of the records.
   a. 10278　b. 08222　c. 20553　d. 17256

6. (10%) A binary tree has eight nodes. Given the following are inorder and post order traversal of the tree. Please draw the binary tree.

Postorder: FECHGDBA　　**Inorder: FECABHDG**

7. (10%) The Fibonacci sequence, Fib (n), is used in science and mathematics as shown in the figure below, using the definition of it to find the following:

$$\text{Fib}(n) = \begin{bmatrix} 0 & if\ n = 0 \\ 1 & if\ n = 1 \\ \text{Fib}(n) = \text{Fib}(n-1) + \text{Fib}(n-2) & if\ n > 1 \end{bmatrix}$$

   a. Fib(5)　b. Fib(8)　c. Fib(10)

8. (15%) Write an algorithm in pseudocode for the insertion sort using while loop.

9. (15%) Please design a warning system that can wireless connect to an ECG device, which sampling rate and resolution is 100 Hz and 8 bits, respectively. If heart rate is less than 60 bpm or higher than 100 bpm, the warning system will be activated. Please give a brief description of your design, especially the specification of wireless transmission.