

國立交通大學 97 學年度碩士班入學考試試題

科目名稱：計算機概論 (5121)

考試日期：97 年 3 月 9 日 第 2 節

所班別：資訊管理研究所

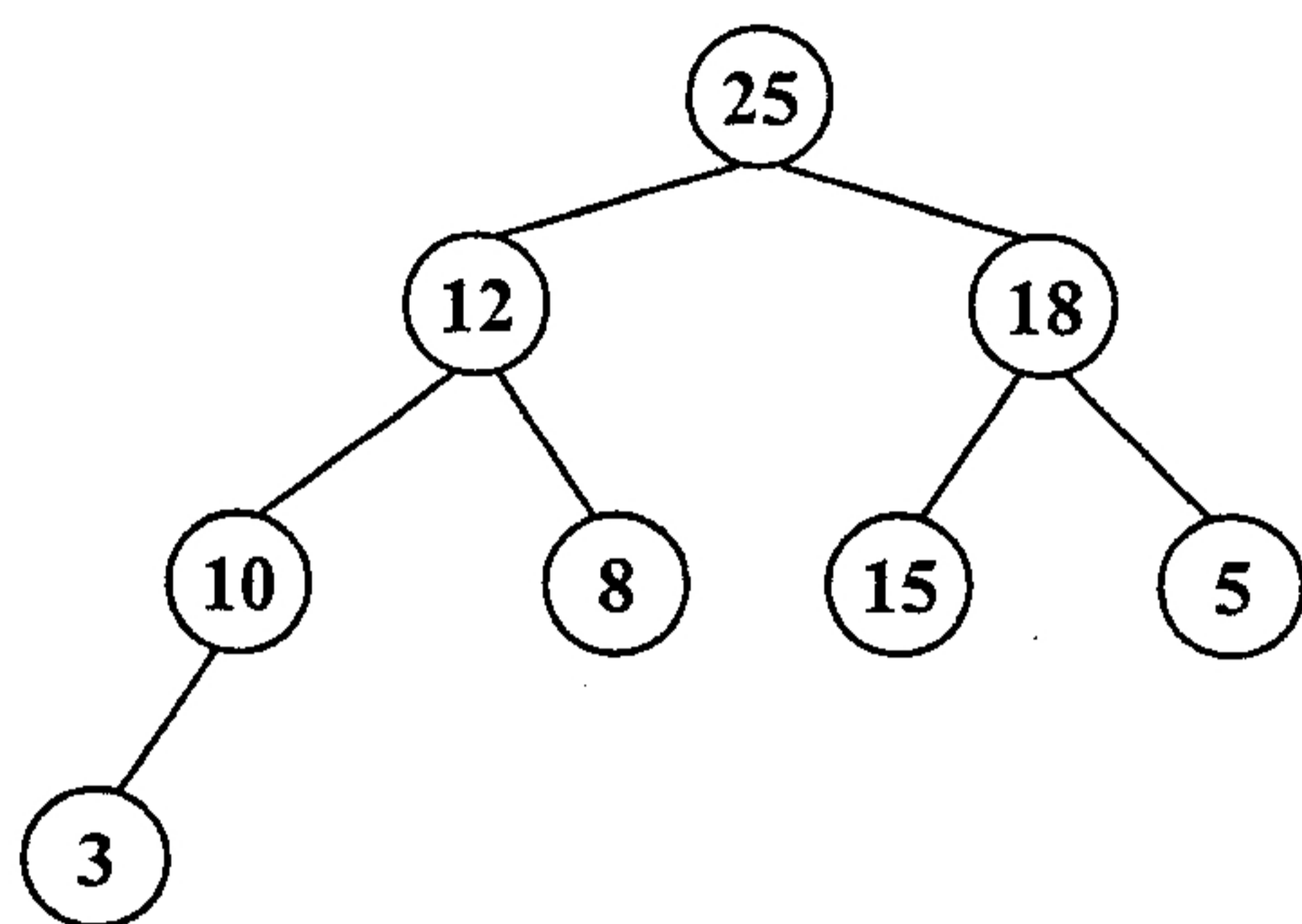
組別：資管所乙組

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作答前請先核對試題、答案卷 (試卷) 與准考證上之所組別與考試科目是否相符!!

問答題：

- (10%) Define the general definition of 3NF, which considers all keys of a relation. What undesirable dependencies are avoided when a relation is in 3NF?
- (8%) Do the heap operations: INSERT(20), and DELETE() on the following max heap step by step. Show the results after each operation. Note: DELETE() is performed after INSERT(20)



3. A generalized list, S , is a finite sequence of $n \geq 0$ elements, $\alpha_0, \alpha_1, \dots, \alpha_{n-1}$, where α_i is either atom or a list. The elements α_i , $0 \leq i \leq n-1$, that are not atoms are said to be the *sublists* of S .
- (a) (2%) Define the node structure for a generalized list.
- (b) (10%) Write a recursive algorithm to search an element in a generalized list.
- (c) (3%) Analyze the time complexity of your algorithm. Assume that a generalized list has a total of m nodes. You need to explain your answer.
4. (11%) In telecommunication, a Hamming code is a linear error-correcting code that can detect and correct single-bit errors. Use this mechanism to add three checking bits (C_1, C_2, C_3) to the following four data bits "B0, B1, B2, B3". Write down the functions that generate C_1, C_2 , and C_3 . Assume that one of the bits is damaged during transmission. Explain how we detect the damaged bit.
5. (11%) (a) Explain why NAND gates are universal gates?
(b) Implement the function $F = \overline{X} \cdot Y + X \cdot \overline{Z}$ by only using the NAND gates.
6. (11%) A number series $F(x)$ is defined as follows:
 $F(0)=0, F(1)=1, F(2)=2$
 $F(x)=F(x-1)+2F(x-2)+3F(x-3)$.
- (a) Calculate $F(5)$
- (b) Write a recursive function (in pseudo code) that takes a parameter n and that computes $F(n)$.
- (4%) Ethics are standards of moral conduct. Computer ethics are guidelines for the morally acceptable use of computers in our society. What are the four primary computer ethics issues?
- (4%) What is the difference between a hexadecimal decoder and a BCD decoder?
9. According to DVD audio format, the sampling rate is 192KHz. The bits per sample is 48. Without any compression in stereo channel, what is the data rate (Kbytes/sec)? (3%) For a 120 minute concert audio recording, what is the total data size (3%)? (Please write down all the computation procedures).

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10. (8%) If there is a sorted file as following: 2,4,7,8,10,13,14,15,18,19,22,24,25,27,36. Please use binary search to find the data 22 and show all the searching sequences.

選擇題：每題各兩分，請按順序回答。

11(a) Assume 16 bits are used to allocate a signed integer in a computer. What is the minimum value represented in the 2's complement representation?

- (a) 8000H
- (b) FFFE H
- (c) 0100H
- (d) 1111H

11(b) 下列何種作業系統可以免費取得核心程式之 source codes?

- a) Window XP
- b) Linux
- c) DOS
- d) Microsoft Vista

11(c) 下列何者是數位浮水印技術的主要應用範圍?

- a) 免費郵件
- b) 網域名稱查詢
- c) 電子商務的安全查核
- d) 記憶體管理

11(d) The _____ controller is a serial device which has 480Mbps data rate and connects I/O devices such as the mouse and the portable disk to the computer.

- (a) SCSI
- (b) IDE
- (c) FireWire
- (d) USB

11(e) If you change the decimal number _____ into the floating point in the IEEE Single Precision, then the truncation error will not occur.

- (a) 205.4
- (b) -55.55
- (c) 12.05
- (d) 0.875

11(f) In the _____ graphic method of representing an image in a computer, the image is decomposed into a combination of curves and lines.

- (a) vector
- (b) bitmap
- (c) RGB
- (d) MIDI