| 考試科目 | 計算機概論 | 所別 | 數位內容碩士學位學程<br>資訊技術組 | 考試時間 | 3月15日 星期日 第3節 |
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1. **[Acronyms]** What do the following abbreviations stand for? Give your answer in English to get full credits (e.g., ROM: Read Only Memory). (10%)
   - CMYK
   - XML
   - MP3
   - SQL
   - JPEG
2. **[Graphic Format]** (1) Discuss the differences (please include at least 3 items) between vector graphics and bitmap images. Give an example each (e.g. bmp for bitmap images.) (8%) (2) Which is easier? Converting bitmap images into vector graphics or converting vector graphics into bitmap images? Why? (2%)
3. **[Boolean Algebra]** (1) Prove that x'+xy=x'+y without using the truth table. (4%) (2) The sum-of-products form of a two-variable logic function can be expressed as : $f(x,y) = \alpha_0 \overline{x}\overline{y} + \alpha_1 \overline{x}y + \alpha_2 x\overline{y} + \alpha_3 xy$
   - How many different functions can be generated for the two-variable case? (3%)
   - How about the N-variable case? (3%)
4. **[Digitization and Compression]** (1) There are three steps involved in digitizing an analog signal. The first step is _____. (Refer to Fig. 4(a)). What happens when not enough samples are kept? (Refer to Fig. 4(b)).

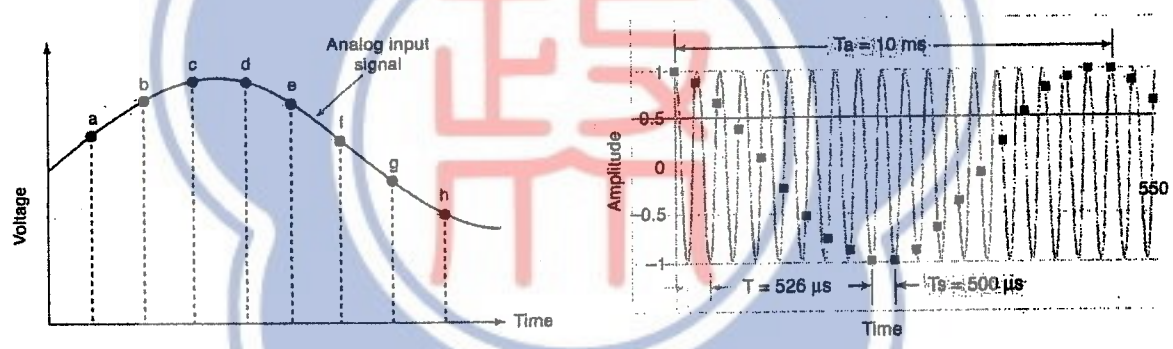


Fig.4(a) Fig. 4(b)

The second step is _____. The third step is encoding. (6%) (2) What's the difference between lossy and lossless compression? Which method usually achieves better compression ratio? (4%)

5. **[IEEE 754 Representation]** The IEEE 754 floating-point standard specifies 64 bit double precision with a 53-bit significand (including the implied 1) and an 11-bit exponent. IA-32 offers an extended precision option with a 64-bit significand and a 16-bit exponent. (a) Assume extended precision is similar to single and double precision, what is the bias of the exponent? (4%) (b) What is the range of numbers that can be represented by the extended precision option? (6%)

| 備考 | 試題隨卷繳交 |
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6. [8%] Please select the letter of the choice that best answers the question:

(i) According the waterfall model for the software life cycle, software upgrading is called
(a) Needs analysis
(b) Algorithm design
(c) Software implementation
(d) Program maintenance

(ii) A database model in which any segment can link to any other segment is called
(a) Hierarchical data model
(b) Network data model
(c) Relational data model
(d) Entity-relationship model

(iii) Which of the following statements regarding the "collision domain" and "broadcast domain" for switch and router is true?
(a) A switch creates a single collision domain and a single broadcast domain. A router creates a single collision domain.
(b) A switch creates separate collision domains but one broadcast domain. A router provides a separate broadcast domain.
(c) A switch creates a single collision domain and separate broadcast domains. A router provides a separate broadcast domain as well.
(d) A switch creates separate collision domains and separate broadcast domains. A router provides separate collision domains.

(iv) Which of the following statements regarding NAT (Network Address Translation) is wrong?
(a) It is usually implemented on router, firewall or server.
(b) It enables some hosts using unregistered IP to connect to Internet.
(c) It has three types: static, dynamic, overloading.
(d) It permanently changes the host's unregistered IP.

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7. [12%]

(i) [6%]Assuming that we have a mobile phone which can receive phone call, email, and short message. We are going to design a program that can handle the above 3 things concurrently. Explain your design logic and/or technical concerns for this program implementation. If needed, you can write down your program to illustrate it.

(ii) [6%] In a time-sharing system, suppose that each CPU burst takes 10 $\mu s$, and we have 3 jobs with job1(arrival time, required execution time) = (0 $\mu s$, 20 $\mu s$), job2=(10 $\mu s$, 50 $\mu s$), and job3=(20 $\mu s$, 30 $\mu s$), respectively. Determine the completion time for each job by using: (Assume no I/O time, context switch time)

(a) FIFO scheduling

(b) preemptive (Assume priority job3 > job2 > job1)

8. [10%] An "*even-parity string*" is usually defined as a bit string with total number of 1's is even. Please define *recursively* the set of even-parity strings, by induction on the length of the string. (*Hint*: It helps to define two concepts simultaneously, both the even-parity strings and the odd-parity strings.) Also prove that your above recursive definition of "even-parity strings" is equivalent to the non-recursive definition.

9. [10%] Suppose that a user wants to browse the Internet on a personal computer, and requests a Web page to be downloaded and then displayed on his/her screen. To perform the request, your browser application creates a "Get Web Page" command. Show the progression of messages as the "Get Web Page" command moves from your computer, through routers, to the remote computer, and back. You should indicate the varieties of header information added or removed by different network protocol layers.

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10. [10%] Consider a simple application-level protocol built on top of UDP that allows a client to retrieve a file from a remote server residing at a well-known address. The client first sends a request with file name, and the server responds with a sequence of data packets containing different parts of the requested file. To ensure reliability and sequenced delivery, client and server use a stop-and-wait protocol. Ignoring the obvious performance issue, do you see a problem with this protocol? If you do, please explain in what case there would be a problem. Think carefully about the possibility of process crashing.



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