

考試科目	資訊科技	所別	資訊管理	考試時間	6月24日 星期二	(上)午第二
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## Computer Network

There are 5 questions in this part and each question weights 10 points.

- 50%
1. Consider building a CSMA/CD network running at 1 Gbps over a 1-km cable with no repeaters. The signal speed in the cable is 200,000 km/sec. What is the minimum frame size?
  2. As a possible congestion control mechanism in a subnet using virtual circuits internally, a router can refrain from acknowledging a received packet until (1) it knows its last transmission along the virtual circuit was received successfully and (2) it has a free buffer. For simplicity, assume that routers use a stop-and-wait protocol and that each virtual circuit has one buffer dedicated to it for each direction of traffic. If it takes  $T$  sec to transmit a packet (data or acknowledgement) and there are  $n$  routers on the path, what is the rate at which packets are delivered to the destination host? Assume that transmission errors are rare, and that the host-router connection is infinitely fast.
  3. A datagram subnet allows routers to drop packets whenever they need to. The probability of a router discarding a packet is  $p$ . Consider the case of a source host connected to the source router, which is connected to the destination router, and then to the destination host. If either of the routers discards a packet, the source host eventually times out and tries again. If both host-router and router-router lines are counted as hops, what is the mean number of
    - a) hops a packet makes per transmission?
    - b) transmissions a packet makes?
    - c) hops required per received packet?
  4. a) A client sends a 128-byte request to a server located 100 km away over a 1-gigabit optical fiber. What is the efficiency of the line during the remote procedure call? (The speed of light in fiber optics is 200 km/msec)  
b) Consider the situation of a) again. Compute the minimum possible response time both for the given 1-Gbps line and for a 1-Mbps line. What conclusion can you draw?

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5. The RSA public key cryptography algorithms are shown as follows:

- 1) Choose two large primes,  $p$  and  $q$ .
- 2) Compute  $n = p * q$  and  $z = (p - 1) * (q - 1)$ .
- 3) Choose a number relatively prime to  $z$  and call it  $e$ , so  $\langle e, n \rangle$  is your public key.
- 4) Find  $d$  such that  $e * d = 1 \pmod{z}$ , so  $\langle d, n \rangle$  is your private key.

Now using the above RSA public key cryptography algorithm, with  $a = 1$ ,  $b = 2$ , etc. to compute the followings:

- a) If  $p = 7$  and  $q = 11$ , list five legal values for  $e$ .
- b) If  $p = 13$ ,  $q = 31$ , and  $e = 7$ , find  $d$ .
- c) Using  $p = 5$ ,  $q = 11$ , and  $d = 27$ , find  $e$  and encrypt "abcde"

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問題一、請說明 Software Restructuring, Software Reverse Engineering, Software Re-engineering 以及其間之差異。(20%)

50%

問題二、在不同之軟體程序階段，可使用不同之設計分析技術。從方法論之觀點而言，常用之設計分析技術可分為三類：功能導向(Function oriented)、物件導向(Object oriented)及狀態導向(State oriented)。請各列舉一工具說明這三種技術及其適用之軟體開發程序階段。(20%)

問題三、解釋名詞：

1. "Waterfall Model" in the context of software development(3%)
2. "Spiral Model" in the context of software development(4%)
3. Domain Analysis(3%)

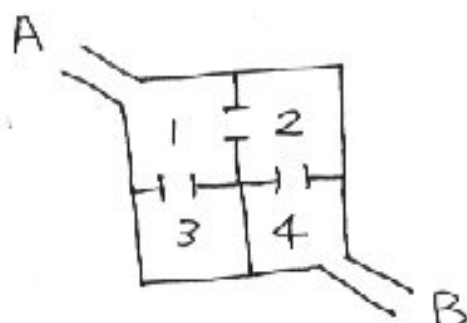
考試科目

數量方法

所別

資訊管理系

考試時間

6月24日 上午第 節  
星期 下卷 1.  
50%

上圖是一個迷宮，一隻老鼠嘗試由A到B，現在放一隻老鼠由A進入“1”，然後老鼠隨機地以相同的機率走向另一個開口，例如，在“1”中，老鼠會以相同的機率走向“2”、“3”及A，當然老鼠由A或B出來會被捉住而結束實驗。

- (5) (1) 用 Markov Chain 來模擬這個過程，定義所需之狀態 (state) 寫出 Transition Probability Matrix.
- (5) (2) (1) 中之狀態 那些是 recurrent? 那些是 absorbing? 那些是 transient.
- (5) (3) 如果老鼠在“1”中，請計算其在二步之內會由A出來之機率?
- (5) (4) 如果老鼠在“1”中，請計算其在三步之內會由B出來之機率?
- (10) (5) 如果  $f_{iB}$  係老鼠目前在  $i$  ( $i=1, 2, 3, 4$ )，最終會由B出來的機率，請建立  $f_{iB}$  之遞迴關係 (recurrent relations)，並求解  $f_{iB}$ ?
- (5) (6) 請計算  $f_{iA}$ ?

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2. 試說明簡捷法 (Simplex Method) 與內點法 (Interior Point Algorithm or Karmarkar's Approach) 在線性規劃上求解，其优缺点之比較?

(15)

考試科目	數量方法	所別	資訊管理研究所	考試時間	6月4日(1)下午第二節 星期二
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或.50%

1. Consider the simple linear regression model

$$Y_i = \beta_0 + \beta_1 X_i + \epsilon_i, \quad i=1, \dots, n$$

(20) with  $E(\epsilon_i) = 0$ ,  $\text{Var}(\epsilon_i) = \sigma^2$ ,  $\text{Cov}(\epsilon_i, \epsilon_j) = 0$   $i \neq j$

(a) Derive the least-squares estimators,  $\hat{\beta}_0$ ,  $\hat{\beta}_1$ , of  $\beta_0$  and  $\beta_1$  respectively.

(b) Show that  $\hat{\beta}_1 = \frac{\sum_{i=1}^n (X_i - \bar{X}) Y_i}{\sum_{i=1}^n (X_i - \bar{X})^2}$  is an unbiased estimator

of  $\beta_1$ .

(c) Show that  $\text{Var}(\hat{\beta}_1) = \frac{\sigma^2}{\sum_{i=1}^n (X_i - \bar{X})^2}$

(d) Show that  $\text{Cov}(\bar{Y}, \hat{\beta}_1) = 0$

2. Let  $X_1, X_2, X_3$  be i.i.d.  $N(\mu, \sigma^2)$  and define

$$Y_1 = X_1 + \delta X_3$$

$$Y_2 = X_2 + \delta X_3, \quad \text{where } \delta \text{ is a constant.}$$

(15) (a) Find the means and variances of  $Y_1$  and  $Y_2$  and their correlation coefficient.

(15) (b) Find the joint distribution of  $Y_1$  and  $Y_2$

(10) (c) Find the joint moment-generating function of  $Y_1$  and  $Y_2$

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- 一) 一般認為，Intranet 是將 Internet 相關資訊技術 (TCP/IP、Web、Browser...) 建構的企業網路架構，應用在企業內部事務的處理上；並以 WEB 技術整合內部的各種資訊作業流程以及 MIS。

試從此觀點探討以下之課題：(30%)

- Intranet 對企業經營管理之衝擊
- Intranet 在企業之應用領域
- 企業建置 Intranet 所面臨之問題

- 二) 資訊管理研究中，學者應用許多相關科系所發展的理论，探討各種不同的資訊管理相關課題。試從 a) 理論內容 b) 應用之資訊管理研究課題，討論以下之理論：(20%)

- Human Activity Theory
- Resource-based Theory of the Firm

貳、50%

- 一、資訊部門的組織結構，有採取集中式 (Centralized) 與分散式 (Decentralized)。另外，又有用戶部門的 EUC (End User Computing)。請說明這三種形式組織的特徵、各組結構適用於什麼環境、以及會有什麼問題？並且要如何解決這些問題？

- 二、請說明 SIS (Strategic Information Systems)、IOS (Inter-Organization Systems)、EIS (Executive Information Systems)、DSS (Decision Support Systems)、OA (Office Automation) 等五種資訊系統之意義，各類種系統應使用什麼系統開發方法。

- 三、組織在引進新資訊科技時，是否應有引進新科技的步驟？請說明 Nolan 所提出的新資訊科技學習階段，各階段應採用什麼管理方式，組織要如何因應？

- 四、資訊部門在企業中，應以何種方式來管理，應視為計價之服務單位，還是純粹以成本中心來管理或其他方式。請說明有幾種管理方式以及使用不同管理方式之時機以及利弊。

- 五、資訊系統開發專案之風險有幾種？組織中可以用什麼方法來降低這些風險？請試從企業自行開發與外包 (outsourcing) 兩種