國立中山大學九十三學年度碩士班招生考試試題

科目：計算機概論 (資管所甲組)

計算機概論

一、單複選 (每題 3 分)

1. 下面那些不是網路與網路相連的設備？(A)Bridge，(B)Coercion，(C)Router，(D)Association，(E)Transistor，(F)Gateway。

2. 下面那些邏輯式子(Logical Formula)的值爲真？(A)p or ~p，(B) p and ~p，(C) p or q or r，(D)((p→q) and p)→q，(E) (p→q) and (~p or q)，(F) (~p→q)。

3. 下面那些是 Client-Side Scripting 動態網頁的範疇？(A)串接樣式表 (cascade style sheet)，(B)VBScript，(C)JavaScript，(D)Java Applet，(E) ASP.NET，(F) Flash。

4. 下面那些是非程序電腦語言(Non-Procedural Computer Language)？(A)Fortran，(B)C++，(C)LISP，(D)Pascal，(E)Prolog，(F)Cobol。

5. 下面那些和資料庫(Data Base)系統有關係？(A)Record，(B)Algorithm，(C)Table，(D)Fishbone Diagram，(E)Table-Relationship Diagrams，(F)Fields。

6. 下面那些和 Web Service 平台有關係？(A)eXtensible Markup Language(XML)，(B)Simple Object Access Protocol(SOAP)，(C)Web Services Description Language(WSDL)，(D)Quality of Service (QOS)，(E) Universal Description, Discovery, and Integration(UDDI)，(F) Writable Control Memory(WCM)。

7. 下面那些和微電腦處理器(Micro Processors)的定址有關係？(A)Immediate Addressing，(B)Uniform Resource Locator，(C)Mail Address，(D)Index Addressing，(E) Internet Address，(F) Direct Addressing。

8. 下面那些和電腦語言處理器(Computer Language Processors)有關係？(A)Interpreter，(B)Parser，(C)Compiler，(D)Assembler，(E)Translator，(F)Lexical Analyzer。

9. 下面那些和結構化系統分析與設計(Structured System Analysis and Design)無關？(A)Data Flow Diagram，(B)Virtual Page Number，(C)Data Dictionary，(D)Inheritance，(E)Action Flow Diagram，(F)Structured Chart。

10. The relation "Greater Than" is a relation which is (A) Transitive，而且 (B) Not Transitive，而且(C) Reflexive，而且(D) Not Reflexive，而且(E)Symmetric，

而且(F) Not Symmetric。

11. 目前流行的所謂USB 袖珍型硬碟或拇指蝶是何種記憶體？(A) DDR, (B) DRAM, (C) Flash Ram, (D) RAMBUS, (E) ROM.

12. 在撰寫橋牌遊戲中抽牌動作之程式時，最有可能用到的函數是 (A) Absolute, (B) Cosine, (C) Memmove, (D) Random, (E) Malloc.

13. 以下之計算複雜度何者爲最高？ (A) O(n!), (B) $O(n^{100})$, (C) $O(n^2 \log n)$, (D) $O(2^n)$, (E) O(10n!).

14. 下列各記憶體空間何者可以容納一張未壓縮的1024*1024 的256 色灰階影像檔案？ (A) 100 Kbytes, (B) 256 Kbytes, (C) 1 Mbytes, (D) 256Mbytes, (E) 1024 Mbytes.

15. A Multithread process 之各threads 沒有共享下列何者? (A) local data, (B) Files, (C) Code, (D) Stacks, (E) Global data.

16. 程式中執行A 除以B 再乘上B，答案居然不是A。因爲是發生何種錯誤？ (A) Run-time error, (B) Truncation error, (C) Logical error, (D) Syntax error, (E) input validation error.

17. RSA 與以下何者相關？(A) 非對稱式密碼系統, (B) 對稱式密碼系統, (C) 指紋辨識系統, (D) 資訊安全系統, (E) 遙測衛星系統.

18. Which of the following statement(s) about Stack(s) is (are) False?
    (A) When implementing a stack, we usually insert data at the front of the stack and remove data from the rear.
    (B) A stack is usually implemented with a circular buffer.
    (C) If a stack is implemented with a linked list of n nodes (where each node has a pointer to the next node and a pointer to the previous node), then inserting a new node to the top of stack takes O(1) operations.
    (D) If a stack is implemented with a linked list of n nodes (where each node has a pointer to the next node and a pointer to the previous node), then removing a node from the top of the stack takes O(1) operations.

19. Which of the following information is normally included in the Process Control Block (PCB)? (A) CPU registers, (B) CPU-scheduling information, (C) I/O device queues, (D) Memory management information.

20. Which of the following statement(s) is (are) true? (A)"System call" is a privileged instruction. (B) Round-robin scheduling must be preemptive. (C) Timer is a technique to protect memory. (D) Busy waiting is a technique to reduce idle time by overlapping I/O and CPU operations.

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二、問答題

1. (8 分) 請利用子網路骨幹(Subnet Backbone)來繪製出整個 Internet 的層次架構(Hierarchy Architecture)。

2. (8 分) 微電腦 I/O 的控制模式主要有(A)查詢模式、(B)中斷模式、(C)DMA 模式等三種，請說明它們的動作狀況。

3. (8 分) 在 Inter Process Communication 的機制裡頭，請描述 Message Passing 和 Monitor 的差異。

4. (4 分) 所謂多形(Polymorphism)，乃是指一個變數(Variable)可以擁有多種資料型態。所謂再利用(Reuse)，乃是指一個操作(Operation)可以用在多個不同的場所。請解釋爲何多形可以導出再利用的效果？

5. (4 分) 假設一個指令執行要 55ns，其執行過程分成五個步驟: Instruction Fetch(10ns), Instruction Decoding(8ns), Execution(10ns), Memory Access(15ns), Write Back(12ns). 現有 100 個指令要執行，若以 pipelining 做法要花多少 ns 可以執行完畢？

6. (8 分) Suppose a 10Mbps Ethernet segment were observed operating at 85% capacity; i.e., over a series of observations, the segment was observed to be carrying bits (header or data) 85% of the time. If an Ethernet frame consists of 26 bytes of overhead (preamble, header, trailer) and 46-1500 bytes of data, what is the effective **data** throughput if all of the frames are **minimum** size frames? What is the effective **data** throughput if all of the frames are **maximum** size frames?

國立中山大學九十三學年度碩士班招生考試試題

科目：管理資訊系統 【資訊管理學系碩士班 甲組】

1. 網際網路興起後，對企業的經營模式與組織結構產生了很大的衝擊，而在解釋網際網路對組織結構如何產生影響的各種理論中，「交易成本理論」(Transaction Cost Theory)是被引用最多的理論，請問(1)何謂交易成本理論？(2)有哪些因素會影響企業的交易成本？(3)交易成本如何影響企業的組織結構？。(25%)
2. 企業資源規劃(ERP)是企業e化的一個重要資訊系統，根據你的觀點，請問ERP對企業而言是不是一種策略性資訊系統(Strategic Information System, SIS)？(1)是(2)不是(3)不一定，請你選擇一個答案並以SIS的主要特性來詳細說明你答案背後的理由。(25%)
3. Business intelligence is mainly used to identify, integrate, and analyze disparate business data from various sources. A manager can make informed decisions, take appropriate action, and improve business operations. Enterprise information systems with business intelligence can turn information into insight, insight into action, and action into business outcomes. Techniques from data/text mining and statistics are widely adopted to achieve business intelligence. A property/casualty insurance company ABC sells its policies on the Web, and adopts the mass customization strategy as its core competence to issue customized policies to their clients. For example, a prospect insuree can buy the policy which covers the loss from car collision with different amount of deduction by different premiums. Different people may need different insured items and coverage. How will you design a business intelligence system to support the customization strategy this strategy to offer policies best fit to customers' needs? What would be the system architecture to integrate the business intelligence system with the company's information systems, such as production management, order management, etc? (25%)
4. When business practice moves toward e-business, Internet technologies become one of the deciding factors for supporting inter-organizational business processes. Take business-to-business (B2B) e-commerce as an example, the prevalence of Internet infrastructure shifts the EDI toward XML type of inter-organizational business transactions. eHubs as Internet-based business-to-business intermediaries that focus on specific business processes, host electronic marketplaces, and use various market-making mechanisms to mediate transactions among businesses.
   (1) Please elaborate how eHubs can create values to buyers and/or sellers under different market-making mechanisms. (15%)
   (2) Please propose a system architecture utilizing specific technologies to include business partners to buy and sell things through eHubs on the Internet. (10%)

選擇題（單選，每題 5 分）：

1. A random sample of size 7 from N(μ, 64) yielded $\bar{x} = 72$. The 95% confidence interval for μ is (a) (66.1, 77.9) (b) (65.6, 78.4) (c) (66.6, 77.4) (d) (67.0, 77.0) (e) (65.1, 78.9)
   Note that: $P(Z > 1.645) = 0.05$ and $P(Z > 1.960) = 0.025$
2. It was claimed that the proportions of male and female students in the national Sun Yat-sen University who select jogging as one of their recreational activities are the same. According to Dr. Yin's informal observation, she assumed that female students like jogging more than male students. Then she performed an empirical test for her assumption. For a random sample of 200 students (males were 125 and females were 75), it was observed 10 male students and 12 female students jog usually. Given the significance level $\alpha = 0.05$, which of the following is the most proper statement to the question?

   (a) $\begin{cases} H_0 : P_m = P_F \\ H_1 : P_m > P_F \end{cases}$ H_0 is rejected (b) $\begin{cases} H_0 : P_m = P_F \\ H_1 : P_m > P_F \end{cases}$ H_0 can not be rejected

   (c) $\begin{cases} H_0 : P_m = P_F \\ H_1 : P_m < P_F \end{cases}$ H_0 is rejected (d) $\begin{cases} H_0 : P_m = P_F \\ H_1 : P_m < P_F \end{cases}$ H_0 can not be rejected

   (e) $\begin{cases} H_0 : P_m = P_F \\ H_1 : P_m \neq P_F \end{cases}$ H_0 is rejected
3. You attend a party of 25 guests. A bowl contains 25 chips, 2 red and 23 white. Each guest is to take one chip from the bowl without replacement. The guest who draws the red chip earns a gift valued 1000 dollars. If you have a choice of drawing first, second or even the last, which position would you choose? (a) First (b) Tenth (c) Twelfth (d) The last (e) It does not matter, because chances are the same.
4. Given $E(X+10) = 15$ and $E[(X+10)^2] = 250$, determine (μ, σ^2) = (a) (15, 250) (b) (15, 25) (c) (5, 225) (d) (5, 25) (e) (5, 15)
5. For a set of data with two variables, X is independent variable and Y is dependent variable. To test whether they have the regression effect, which of the following statements is not true? (a) Test the slope parameter of the regression line. (b) Compute the ANOVA table. (c) If their correlation coefficient is tested to be zero (H_0: $\rho = 0$, cannot be rejected), they don't have the regression relationship. (d) If the residuals seem like a normal distribution, the simple regression is proper to test for the relationships between variables X and Y. (e) Variable Y should close to the normal distribution.
6. Let the joint p.d.f. of X and Y be $f(x, y) = x + y$, $0 \le x \le 1$, $0 \le y \le 1$. For the following answers, which is true? (a) X and Y are independent (b) The probability of the event $(x, y) = (0.2, 0.1)$ is 0.3 (c) $f_1(x) = 0.5+x$, $0 \le x \le 1$ (d) $f_1(x) = 0.5+xy$, $0 \le x \le 1$, $0 \le y \le 1$ (e) $f_1(x) = 0.5x$, $0 \le x \le 2$.
7. For the following set of data, it is computed $SS(E)/(n-m) = 1$ (mean square of error) and $SS(T)/(m-1) = 231$ (mean square of treatments),

X_1:	3	4	5
X_2:	13	14	15
X_3:	24	25	26
X_4:	17	18	19

   The values of (n, m) = (a) (3, 4); (b) (4, 3); (c) (11, 4); (d) (12, 3); (e) (12, 4).
8. According to question 7 (第 7 題), it can be concluded that the unbiased estimate of σ^2 based on SS(T) is usually greater than σ^2 when (a) the true means are unequal (b) the true means are equal (c) the true variances are unequal (d) the true variances are equal (e) none of the above is correct.

Questions 9 and 10 refer to the following statements:

A candy maker produces chocolate that have a label weight of 30 grams. Let X denote the weight of a single chocolate selected at random from the production line. Nineteen observations of X, that have been ordered as well as each standard normal quantiles (z_{1-p}), are shown in the Table 1. Some descriptive statistics are given in Table 2.

Table 1: Chocolate weights and the standard normal quantiles corresponding to $p = k/20$

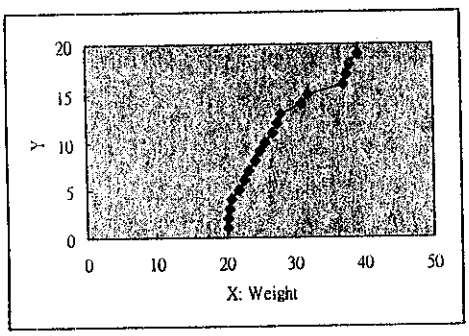
k	1	2	3	4	5	6	7	8	9	10
Weight (x)	20.29	20.34	20.64	20.91	22.01	22.77	23.28	24.39	24.90	25.70
$p = k/20$	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5
z_{1-p}	-1.64	-1.28	-1.03	-.84	-.67	-.52	-.39	-.25	-.13	0
k	11	12	13	14	15	16	17	18	19	
Weight (x)	26.86	27.64	28.15	31.07	31.93	37.26	37.70	37.98	39.17	
$p = k/20$	0.55	0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95	
z_{1-p}	0.13	0.25	0.38	0.52	0.67	0.84	1.04	1.28	1.64	

Table 2: Descriptive statistics

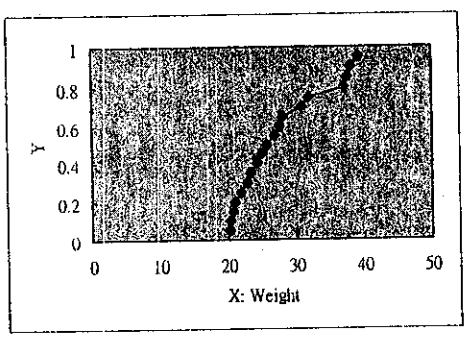
Mean	Median	Standard deviation	Standard error
27.5	25.7	6.5	1.49

9. Which of the following diagrams is the q-q plot according to the data given in Table 1?

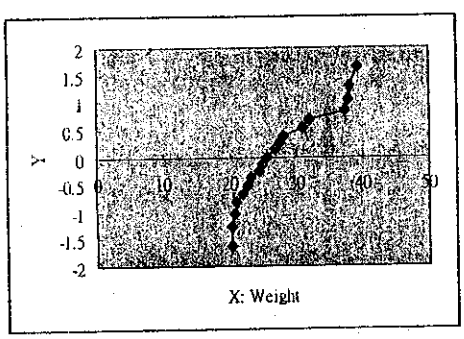
(a)



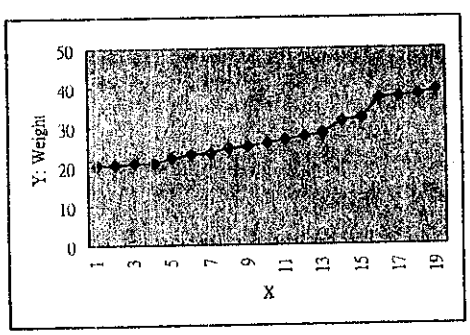
(b)



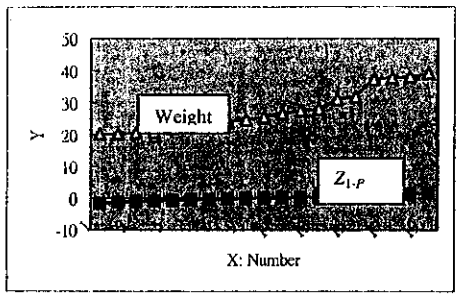
(c)



(d)



(e)



10. As shown in Table 2, the standard deviation is 6.5. What is the proportion of those observations falling in the area that is one standard deviation around the sample mean? (Note that: $P(Z > 1) = 0.1587$) (a) 0.68 (b) 0.58 (c) 0.48 (d) 0.50 (e) 0.32.

計算題（50 分）：

一、某電視工廠之映像管是兩家供應商所提供，A 供應商負責 75%而 B 供應商負責 25%。A 產製映像管之不良率為 10%，而 B 之不良率僅為 2%，若隨機抽取一個映像管，請計算係由 A 生產之機率：

(a) 如果映像管是不良品？(5)

(b) 如果映像管是良品？(5)

二、某工廠要探討影響生產線產量之因素，三台機器與五位操作員被選中做隨機實驗，其結果如下：

	Machine		
Operator	1	2	3
1	53	61	51
2	47	55	51
3	46	52	49
4	50	58	54
5	49	54	50

假設機器與操作員間無交互影響〔α=0.05，F(2,8)=4.46，F(4,8)=3.84〕

(a) 不同的機器對產品的生產有無影響？(5)

(b) 不同的操作員對產品的生產有無影響？(5)

三、為了檢定台北市學生患近視的比例是否等於 50%，於台北市隨機抽出 20 個學生，設 X 為這 20 位學生中患有近視的人數，倘若 $8 \leqq X \leqq 12$，則接受虛無假設 H_0：$p = 0.50$；否則，接受對立假設 H_1：$p \neq 0.50$。〔二項分配值, n=20, p = 0.50, P(X≦7)=0.132, P(X≦8)=0.252, P(X≦12)=0.868, P(X≦14)=0.979; p = 0.40, P(X≦7)=0.416, P(X≦8)=0.596, P(X≦12)=0.979〕

(a) 若虛無假設成立，X 的機率分配是什麼？(5)

(b) 求此檢定規則的顯著水準 α。(5)

(c) 當 $p = 0.4$ 時，求此檢定規則會產生型二誤差的機率 β。(5)

四、某輪胎製造商宣稱其所生產的輪胎至少可行駛 5 萬公里。已知這種輪胎可行駛的里程數為常態分配，且母體標準差為 2,600 公里。今測試 25 個輪胎，得其平均行駛里程為 49,000 公里，試問 ($Z_{0.01}$ = 2.33)：

(a) 虛無假設與對立假設各為何？(5)

(b) 在 1%的顯著水準下，是否要拒絕虛無假設？(5)

(c) 若樣本數增為 49 個，樣本平均數仍為 49,000 公里，則題(b)之答案是否一樣？(5)

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2. 下面那些邏輯式子(Logical Formula)的值爲真？(A)p or ~p，(B) p and ~p，(C) p or q or r，(D)((p→q) and p)→q，(E) (p→q) and (~p or q) ，(F) (~p→q)。

3. 下面那些是 Client-Side Scripting 動態網頁的範疇？(A)串接樣式表 (cascade style sheet)，(B)VBScript，(C)JavaScript，(D)Java Applet，(E) ASP.NET，(F) Flash。

4. 下面那些是非程序電腦語言(Non-Procedural Computer Language)？(A)Fortran，(B)C++，(C)LISP，(D)Pascal，(E)Prolog，(F)Cobol。

5. 下面那些和資料庫(Data Base)系統有關係？(A)Record，(B)Algorithm，(C)Table，(D)Fishbone Diagram，(E)Table-Relationship Diagrams，(F)Fields。

6. 下面那些和 Web Service 平台有關係？(A)eXtensible Markup Language(XML)，(B)Simple Object Access Protocol(SOAP)，(C)Web Services Description Language(WSDL)，(D)Quality of Service (QOS)，(E) Universal Description, Discovery, and Integration(UDDI) ，(F) Writable Control Memory(WCM)。

7. 下面那些和微電腦處理器(Micro Processors)的定址有關係？(A)Immediate Addressing，(B)Uniform Resource Locator，(C)Mail Address，(D)Index Addressing，(E) Internet Address，(F) Direct Addressing。

8. 下面那些和電腦語言處理器(Computer Language Processors)有關係？(A)Interpreter ，(B)Parser，(C)Compiler，(D)Assembler，(E)Translator，(F)Lexical Analyzer。

9. 下面那些和結構化系統分析與設計(Structured System Analysis and Design)無關？(A)Data Flow Diagram ，(B)Virtual Page Number，(C)Data Dictionary，(D)Inheritance，(E)Action Flow Diagram，(F)Structured Chart。

10. The relation "Greater Than" is a relation which is (A) Transitive，而且 (B) Not Transitive，而且(C) Reflexive，而且(D) Not Reflexive，而且(E)Symmetric，

而且(F) Not Symmetric。

11. 目前流行的所謂USB 袖珍型硬碟或拇指蝶是何種記憶體？(A) DDR, (B) DRAM, (C) Flash Ram, (D) RAMBUS, (E) ROM.

12. 在撰寫橋牌遊戲中抽牌動作之程式時，最有可能用到的函數是 (A) Absolute, (B) Cosine, (C) Memmove, (D) Random, (E) Malloc.

13. 以下之計算複雜度何者爲最高？ (A) O(n!), (B) $O(n^{100})$, (C) $O(n^2 \log n)$, (D) $O(2^n)$, (E) O(10n!).

14. 下列各記憶體空間何者可以容納一張未壓縮的1024*1024 的256 色灰階影像檔案？ (A) 100 Kbytes, (B) 256 Kbytes, (C) 1 Mbytes, (D) 256Mbytes, (E) 1024 Mbytes.

15. A Multithread process 之各threads 沒有共享下列何者? (A) local data, (B) Files, (C) Code, (D) Stacks, (E) Global data.

16. 程式中執行A 除以B 再乘上B，答案居然不是A。因爲是發生何種錯誤？ (A) Run-time error, (B) Truncation error, (C) Logical error, (D) Syntax error, (E) input validation error.

17. RSA 與以下何者相關？(A) 非對稱式密碼系統, (B) 對稱式密碼系統, (C) 指紋辨識系統, (D) 資訊安全系統, (E) 遙測衛星系統.

18. Which of the following statement(s) about Stack(s) is (are) False?
    (A) When implementing a stack, we usually insert data at the front of the stack and remove data from the rear.
    (B) A stack is usually implemented with a circular buffer.
    (C) If a stack is implemented with a linked list of n nodes (where each node has a pointer to the next node and a pointer to the previous node), then inserting a new node to the top of stack takes O(1) operations.
    (D) If a stack is implemented with a linked list of n nodes (where each node has a pointer to the next node and a pointer to the previous node), then removing a node from the top of the stack takes O(1) operations.

19. Which of the following information is normally included in the Process Control Block (PCB)? (A) CPU registers, (B) CPU-scheduling information, (C) I/O device queues, (D) Memory management information.

20. Which of the following statement(s) is (are) true? (A)"System call" is a privileged instruction. (B) Round-robin scheduling must be preemptive. (C) Timer is a technique to protect memory. (D) Busy waiting is a technique to reduce idle time by overlapping I/O and CPU operations.

國立中山大學九十三學年度碩士班招生考試試題

科目：計算機概論(含作業系統)　(資管所 乙組)

二、問答題

1. (8 分) 請利用子網路骨幹(Subnet Backbone)來繪製出整個 Internet 的層次架構(Hierarchy Architecture)。

2. (8 分) 微電腦 I/O 的控制模式主要有(A)查詢模式、(B)中斷模式、(C)DMA 模式等三種，請說明它們的動作狀況。

3. (8 分) A computer whose processes have 1024 pages in their address space keeps in its page tables in memory. The overhead required for reading a word from the page table is 200 ns. To reduce this overhead, the computer has an associative memory, which holds 32 pairs, and can do a look up in 80 ns. What hit rate is needed to reduce the mean overhead to 120 ns?

4. (4 分) A computer has 11 tape drivers, with n processes competing for them. Each process may need 3 drivers at the same time. What is the maximum value of n that keeps the system deadlock free?

5. (4 分) 假設一個指令執行要 55ns，其執行過程分成五個步驟: Instruction Fetch(10ns), Instruction Decoding(8ns), Execution(10ns), Memory Access(15ns), Write Back(12ns). 現有 100 個指令要執行，若以 pipelining 做法要花多少 ns 可以執行完畢？

6. (8 分) Suppose a 10Mbps Ethernet segment were observed operating at 85% capacity; i.e., over a series of observations, the segment was observed to be carrying bits (header or data) 85% of the time. If an Ethernet frame consists of 26 bytes of overhead (preamble, header, trailer) and 46-1500 bytes of data, what is the effective **data** throughput if all of the frames are **minimum** size frames? What is the effective **data** throughput if all of the frames are **maximum** size frames?

National Sun Yat-Sen University
Graduate Entrance Examination (Data Structure), 2004

1. (10%) Suppose that the head of a moving-head disk with 200 tracks, numbered 0 to 199, is currently serving a request at track 143 and has just finished a request at the track 125. Supposed that the requests are coming in the following order: 86, 150, 92, 175, 95, 149, 4. If an FCFS algorithm is used to schedule the request, what is the total number of head movement?

2. (15%) The following are two programming problems.

   i) A[] is an ascending ordered array, n is the number of the elements in array A[]. Given a key value, the binary search program (with the line number) will do as follows. Please point out the line number(s) where the code is incorrect and fix the mistake.

```
1.  #define NOT_FOUND  1
2.  int binary_search(int A[], int key, int n)
3.  {
4.          int low, mid, high;
5.          low = 0;
6.          high = n;
7.          while (low > high)
8.          {
9.              mid = (low + high) / 2;
10.             if (A[mid] < key)   low = mid –1;
11.             else if (A[mid] > key)   high = mid –1;
12.             else return(mid);
13.         }
14.         return (NOT_FOUND);
15. }
```

   ii) This is an example of C++ function overloading. What is the answer after the execution of function main()?

```
void sub(int x, int y=3)
{
```

```
    cout<<x+y<<endl;
}
void sub(double x, int y)
{
    cout<<x*y<<endl;
}
main()
{
    sub(5, 2.5);
    }
```

3. (10%) Consider three different memory allocation schemes: First-fit, Best-fit, and Worst-fit. Given memory partitions of 100K, 500K, 200K, 300K, and 600K (in order), and processes of 210K, 410K, 110K, and 420K (in order), which algorithm makes the best use of memory?
4. (15%) Consider the following page reference string: 1, 2, 3, 4, 2, 1, 3, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3.
   i) Assume the system has FOUR memory frames and they are all initially empty. The first fetching of a page to an empty frame counts for one page fault. How many page faults will the LRU replacement algorithm have?
   ii) How many page faults will the FIFO replacement algorithm have?
   iii) How many page faults will the optimal replacement algorithm have?
5. (10%) The question deals with object-oriented design principles. Draw a single class inheritance diagram for the following set of classes:
   - class Vehicle extends Object and defines methods ride() and move().
   - class Car extends Vehicle and defines methods drive() and stop().
   - class Yugo extends Car and defines instance variable "oil" and methods drip() and burn().
   - class Honda extends Car and defines instance variable "fuel" and method sip().
   - class Volvo extends Car and defines methods crash(), popAirBags(), and stop().
   - class SportUtility extends Vehicle and defines instance variable "allWheelDrive" and method roadTrip().
6. (10%) Suppose you are asked to use two stacks, YinStack and YangStack, as your only instance variables to implement the Queue abstract data type.
   i) Describe in pseudo-code with comments how you would implement the

methods enqueue() and dequeue().

ii) Use the big-Oh notation to characterize the running times for the methods enqueue() and dequeue() in this implementation in terms of n, the number of elements in the queue.

7. (15%) Here are two questions for algorithm concept.

i) Assume you are implementing the priority queue with a doubly-linked list with header and trailer nodes. Fill in the missing line in the following Java implementation of the insertAfter method. Assume that doubly-linked nodes themselves are implementing the Position interface; hence, they contain instance variables element and container and implement methods with these same names.

```
public DoubleNode insertAfter{Position p, Object e) {
    DoubleNode temp = new DoubleNode();
    temp.element = e;
    temp.container = this;
    temp.prev = p;
    temp.next = p.next;
    _____ // Fill in this step.
    p.next = temp;
    return temp;
}
```

ii) Consider the following algorithm described in pseudo-code, which takes an array A of n positive integers as input and uses an initially-empty queue Q as an internal variable:

```
Let t = 0
for i = 0 to n - 1 do
    if A[i] is an odd number then
        Q.enqueue(A[i])
    else
    while Q is not empty do
        Let t = t + Q.dequeue()
```

end while

end if

end for

while Q is not empty **do**

Let $t = t + Q$.dequeue()

end while

Output t.

Please answer each of the following question concerning this algorithm:

1) What is the output of this algorithm for the array A = [1; 9; 11; 14; 5; 3; 7; 13; 3; 12; 5]?
2) Describe in one sentence what this algorithm computes.
3) Characterize, using the big-Oh notation, the running time of the above algorithm in terms of n, the number of integers in A.

8. (15%) There is a town with N citizens. It is known that some pairs of people are friends. According to the famous saying that "The friends of my friends are my friends, too", it follows that if A and B are friends and B and C are friends then A and C are friends, too. Your task is to find out the largest group of friends and count how many people there are. (For you reference, the input will consists of N and M, where N is the number of town's citizens and M is the number of pairs of people, which are known to be friends. After that there follows M lines consists of two integers A and B, which describe that A and B are friends.) Note that you have to describe how you solve this problem first and then give the pseudo code to implement your idea.