

**(I) Please define the following terms: (16%)**

- 1、Virtual Reality Modeling Language (VRML)[4%]
- 2、Wisdom of Crowds[4%]
- 3、Churn rate[4%]
- 4、Social shopping[4%]

**(II) Short Answer (34%)**

1. Explain how text mining and web mining differ from conventional data mining?  
[4%]
2. Describe how partner relationship management (PRM) and employee relationship management (ERM) are related to custom relationship management (CRM)? [6%]  
Distinguish between operational and analytical CRM? [4%]
3. Define case-based reasoning, and explain how it differs from an expert system?  
[8%]
4. Define and describe fuzzy logic, genetic algorithms, and intelligent agents? [6%]  
Explain how each works and the kinds of problems for which each is suited? [6%]

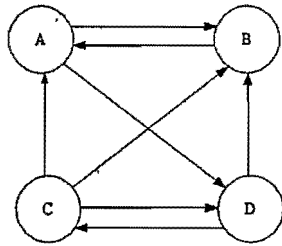
**(III) Essay: (50%)**

1. What is Cloud Computing? Describe its challenges and opportunities. (25%)
2. What is Service Oriented Architecture? Describe the architecture and explain a practical example of SOA. (25%)



## (一)、簡答題(30 分，每題 3 分)

1. 何謂引線二元樹(threaded binary tree)?
2. 試舉出日常生活中運用到堆疊(stack)和佇列(queue)結構方式的例子各一個。
3. 試利用鄰接矩陣(adjacency matrix)表示下圖之圖形。



4. 假設有一費氏數列(Fibonacci number)的定義為  $F_0=2$ 、 $F_1=3$ 、 $F_n=2F_{n-1}+3F_{n-2}$ 。試問  $F_6$  等於多少?
5. 假設陣列 A 元素大小為 4， $A[2][3]$  的位址為 60， $A[3][2]$  的位址為 76，試問  $A[4][3]$  的位址為多少?
6. 若  $A=1$ 、 $B=2$ 、 $C=3$ 、 $D=4$ ，後置(postfix)算數式  $CD \times AB \times A //$  之值為何?
7. 假設有一組順序為【18、90、36、3、56、28】的資料，試問經過 2 次氣泡排序(bubble sort)升序(ascending)後，這組資料的順序為何?
8. 假設有一組順序為【18、90、36、3、56、28】的資料，試建構出此組資料的二元搜尋樹(binary search tree)?
9. 假設有一組順序為【18、88、41、30、74、55】的資料，利用除法雜湊函數(division hashing function)法將此組資料放入一個有 9 個位置的儲存空間中，其結果為何?
10. 假設有一組已排序的資料為【3、18、28、36、43、56、78、81、90】，利用二元搜尋(binary search)法搜尋 90 時，需經幾次比對後才可以找到?

## (二) 問答題 (70 分)

1. 試設計利用陣列(array)來表示二元樹的方法，並舉一個實例說明之。(10 分)
2. 試證明選擇排序法(selection sort)平均(average)所花時間為  $O(N^2)$ ， $N$  為資料筆數。(10 分)



國立雲林科技大學

100 學年度碩士班暨碩士在職專班招生考試試題

系所：資管系

科目：資料結構(2)

3. 假設有一個串列(linked list)結構，它的節點由一個整數值及一個指向與自己相同節點的指標所組成。試寫出一個遞迴程式，以計算此串列結構中節點整數值的總和，在此程式中需包含有結構的宣告。(15分)
4. 假設有一組順序為【11, 12, 13, 15, 14, 8, 9, 10, 1, 2, 3, 4, 5, 6, 7】的資料，試建構出此組資料的 AVL 樹，並寫出它的建構過程。註：首先寫出每個值放入後的 AVL 樹，若 AVL 樹需要調整則再寫出經過調整後的 AVL 樹。(15分)
5. 假設字母出現的頻率(次數)為【A: 25, B: 31, C: 15, D: 22, E: 12, F: 11】，試畫出它的 Huffman Code 的樹，並比較此種方法與使用固定長的方法來表示字母的優缺點。(20分)



## 第一部份 單選題 50% (每題兩分)

(請依題號作答並將答案寫在答案卷上，只寫在試題卷上不予計分。答案請採橫式書寫，每行 5 題，並請註明題號)

1. Which of the following is *not* a concept of entity-relationship data model?  
(A) composite attribute (B) operator overloading (C) key (D) total participation (E) recursive relationship
2. Which of the following is *not* a concept of relational data model?  
(A) multivalued attribute (B) tuple (C) candidate key (D) foreign key (E) NULL value
3. The schema of a database is sometimes called the \_\_\_\_\_.  
(A) extension (B) database state (C) intension (D) data model (E) tuples
4. A \_\_\_\_\_ in SQL terminology is a single table that is derived from other tables.  
(A) trigger (B) base table (C) meta-data (D) view (E) constraint
5. Entity types that do not have key attributes of their own are called \_\_\_\_\_ entity types in the entity-relationship data model.  
(A) derived (B) virtual (C) incomplete (D) partial (E) weak
6. The \_\_\_\_\_ constraint states that no primary key value can be NULL.  
(A) referential integrity (B) candidate key (C) foreign key (D) entity integrity (E) NULL
7. In a(n) \_\_\_\_\_ attack, the attacker injects a string input through the application, which changes or manipulates the SQL statement to the attacker's advantage.  
(A) SQL injection (B) denial of service (DOS) (C) SQL virus (D) virus injection (E) SQL worm
8. Which of the following is *not* commonly accepted database security goal?  
(A) integrity (B) availability (C) confidentiality (D) efficiency (E) none of the above.
9. Which analysis technique is closely related to Business Intelligence?  
(A) computer network (B) data mining (C) SQL (D) XML (E) computer graphics
10. Which one of the following is usually used to process the data stored in a data warehouse?  
(A) OLTP (B) relational algebra (C) OLAP (D) SQL (E) PHP.
11. A \_\_\_\_\_ is a collection of objects that are inserted and removed according to the last-in first-out principle.  
(A) stack (B) queue (C) heap (D) hash table (E) linked list



12. In the context of object-oriented design, \_\_\_\_\_ refers to the ability of an object variable to take different forms.  
 (A) polymorphism (B) inheritance (C) multivalued attribute (D) reference (E) subclass.
13. What is the time complexity of Algorithm 1?  
 (A)  $O(n)$  (B)  $O(n^2)$  (C)  $O(\log n)$  (D)  $O(n \log n)$  (E)  $O(2^n)$
- Algorithm 1**  
**for**  $i \leftarrow 0$  **to**  $n - 1$  **do**  
    $a \leftarrow 0$   
   **for**  $j \leftarrow 0$  **to**  $i$  **do**  
      $a \leftarrow a + X[j]$   
    $A[i] \leftarrow a / (i + 1)$   
**return** array  $A$
14. Assume array  $X[0..4] = [5\ 9\ 1\ 1\ 4]$  and  $n = 5$ . What is the result of the returned array  $A$  by Algorithm 1?  
 (A)  $[5\ 9\ 1\ 1\ 4]$  (B)  $[7\ 5\ 4\ 4]$  (C)  $[5\ 7\ 5\ 4\ 4]$  (D)  $[4\ 4\ 4\ 4\ 4]$  (E)  $[14\ 10\ 2\ 5]$
15. How many times has the statement  $a \leftarrow a + X[j]$  been executed in Algorithm 1?  
 (A)  $n \times i$  (B)  $n(n + 1) / 2$  (C)  $n^2$  (D)  $i^2$  (E)  $i(i + 1) / 2$
16.  $f(n)$  is  $O(g(n))$  means that  $f(n)$  is \_\_\_\_\_ another function  $g(n)$  up to a constant factor and in the asymptotic sense as  $n$  grows toward infinity.  
 (A) greater than (B) equal to (C) less than or equal to (D) greater than or equal to (E) none of the above.
17. Which one is not a collision-handling scheme with respect to a hash table?  
 (A) linear probing (B) separate chaining (C) double hashing (D) open addressing (E) overwriting.
18. Which one of the following programming languages is processed by an interpreter rather than a compiler?  
 (A) C (B) Delphi (C) FORTRAN (D) PHP (E) none of the above.
19. Which of the following is a Web browser released by Google in recent years?  
 (A) Firefox (B) Chrome (C) IE (D) Mozilla (E) Opera
20. A computer's software can be divided to two broad categories: application software and system software. Which one of the following is application software?  
 (A) operating system (B) shell (C) kernel (D) Microsoft Word (E) none of the above.



21. \_\_\_\_\_, the condition in which two or more processes are blocked from progressing because each is waiting for access to resources allocated to another, can arise during resource allocation.  
(A) Overloading (B) Awaiting (C) Deadlock (D) Intersection (E) Time sharing
22. What is the hexadecimal notation for the bit pattern 111001011011?  
(A) 323 (B) 3122 (C) AC3 (D) E5B (E) none of the above
23. What is the result of performing XOR operation on two bit patterns: 10000011 and 11101100?  
(A) 01101111 (B) 11101111 (C) 10000000 (D) 10010000 (E) none of the above
24. Which one of the following is a declarative programming language?  
(A) C (B) PHP (C) Delphi (D) Java (E) Prolog
25. The process of converting a program from one language to another is called *translation*. What is the correct order of the translation process consisting of three activities, Parsing (P), Code generation (C) and Lexical analysis (L)?  
(A) P→C→L (B) L→P→C (C) C→L→P (D) P→L→C (E) C→P→L

**第二部份 單選題 50% (每題兩分)**

(請依題號作答並將答案寫在答案卷上，只寫在試題卷上不予計分。答案請採橫式書寫，每行 5 題，並請註明題號)

26. Separate the following four words so that the similar words are in one group  
**recursive      iterative      inductive      repeat**  
(A){recursive, iterative} and {inductive, repeat}  
(B){recursive, inductive} and {iterative, repeat}  
(C){recursive, repeat} and {inductive, iterative}  
(D){recursive} and {iterative, inductive, repeat}
27. Any data or instruction entered into the memory of a computer is considered as \_\_\_\_\_.  
(A) storage (B) output (C) input (D) information (E) None of these
28. A collection of related information sorted and dealt with as a unit is a \_\_\_\_\_.  
(A) disk (B) data (C) file (D) floppy (E) None of these
29. The process of a computer receiving information from a server on the Internet is known as \_\_\_\_\_.  
(A) pulling (B) pushing (C) downloading (D) transferring (E) None of these
30. \_\_\_\_\_ is the process of carrying out commands.  
(A) Fetching (B) Storing (C) Executing (D) Decoding (E) None of these



31. Which of the following groups consist of only output devices?  
 (A) Scanner, Printer, Monitor (B) Keyboard, Printer, Monitor (C) Mouse, Printer, Monitor (D) Plotter, Printer, Monitor (E) None of these
32. A repair for a known software bug, usually available at no charge on the internet, is called a (n) \_\_\_\_\_.  
 (A) version (B) Patch (C) Tutorial (D) FAQ (E) None of these
33. In the URL <http://www.upscportal.com/>, the portion labelled http is the \_\_\_\_\_.  
 (A) host (B) domain name (C) protocol (D) top-level domain (E) None of these
34. The ability to easily add additional users means that a network is \_\_\_\_\_.  
 (A) Scalable (B) dedicated (C) Decentralized (D) Secure (E) None of these
35. The number of pixels displayed on a screen is known as the screen \_\_\_\_\_.  
 (A) resolution (B) color depth (C) refresh rate (D) viewing size (E) None of these
36. If you wish to extend the length of the network with less signal degrade, you would use a \_\_\_\_\_.  
 (A) repeater (B) router (C) gateway (D) splitter (E) None of these
37. The time it takes a device to locate data and instructions and make them available to CPU is known as \_\_\_\_\_.  
 (A) clock speed (B) a processing cycle (C) CPU speed (D) access time (E) None of these
38. A(n) \_\_\_\_\_ is a private corporate network, used exclusively by company employees.  
 (A) Internet (B) local area network (C) peer-to-peer (D) extranet (E) None of these
39. Thrashing occurs when  
 (A) too much of the time is spent in waiting to swap between memory and disk.  
 (B) two processes try to access the same resource.  
 (C) the size of the data to be inserted is less than the size of a page in memory.  
 (D) the processor's mapping table discovers that the program is trying to use an address that doesn't currently exist.
40. Which of the following allows devices on one network to communicate with devices on another network?  
 (A) multiplexer (B) gateway (C) t-switch (D) modem
41. A station in a network forwards incoming packets by placing them on its shortest output queue. What routing algorithm is being used?  
 (A) flooding (B) hot potato routing (C) static routing (D) delta routing



42. The communication mode that supports data in both directions at the same time is  
 (A) simplex (B) half-simplex (C) full-duplex (D) multiplex
43. A 'C' program contains the declarations and initial assignments:  
`int i=8, j=5;`  
 The value of arithmetic expression is int from  
`2*((i/5)+(4*j-3)%(i+j-2))` is  
 (A) 18 (B) 14 (C) 1 (D) 17 (E) 0
44. Which of the following is used to transfer data and information from a portable device such as a notebook or PDA to a desktop computer?  
 (A) Infrared (B) Microwave (C) Satellite (D) Broadcast radio
45. This type of network provides access to regional service providers and typically span distances greater than 100 miles.  
 (A) LAN (B) MAN (C) WAN (D) WLAN
46. This provides in one tool an uncomplicated interface to the Internet and Web documents.  
 (A) Internet service providers (B) Browsers (C) E-mail (D) Filters
47. The CAN-SPAM Act requires that marketing-related e-mail provide a/an \_\_\_\_\_ option.  
 (A) opt-out (B) no-send (C) only-once (D) block-me
48. which of the following statement is true?  
 (A) MIDI files and WAVE files are similar (B) MIDI files are comparatively smaller than WAVE files (C) MIDI files are video files and Wave are Audio files (D) MIDI files are larger than WAVE files
49. The acronym 'PPP' stands for:  
 (A) Peer to Peer Protocol (B) Point to Point Protocol (C) Program to Program Protocol (D) Personal to Personal Protocol (E) Procom to Procom Protocol
50. \_\_\_\_\_ means listening or reading the communications from others on a chat group or list.  
 (A) Lurking (B) Flaming (C) Spying (D) Key-holing





## (一) 選擇題：單選題，每題 5%。

1. A company has two production lines for plastic bottles, A and B. Two percent of the bottles coming off of line A are defective and 8% of those off of line B are defective. Line A produces three times as many bottles as Line B. If a bottle is selected at random and found to be defective, what is the probability that it came from line A?  
(A) 0.04      (B) 0.035      (C) 0.15      (D) 0.4286      (E) 0.625
2. The probability of stock A rising is 0.3 and of stock B is 0.4. If stocks A and B are not independent and the probability of both stocks rising is 0.09, what is the probability that neither stock rises?  
(A) 0.61      (B) 0.12      (C) 0.39      (D) 0.91      (E) 0.03
3. A thoroughbred horse-racing facility has opened a drive-through wagering booth. Research has shown that the number of visitors to this booth will be Poisson-distributed an average arrival rate of 3 customers per hour. What is the probability that more than 2 customers will arrive at this booth in any half-hour period?  
(A) 0.0011      (B) 0.0133      (C) 0.4150      (D) 0.5850      (E) 0.9018
4. A new medicine has an 85% success rate. Twenty patients are treated with it. What is the mean and the standard deviation (SD) of this distribution?  
(A) Mean = 17, SD = 1.597      (B) Mean = 17, SD = 2.55      (C) Mean = 3, SD = 1.597  
(D) Mean = 3, SD = 2.55      (E) None of the above
5. From a group of six men and four women, a committee of four is to be chosen. What is the probability that this committee consists of exactly two men and two women?  
(A) 1/10      (B) 5/7      (C) 1/14      (D) 3/7      (E) None of the above
6. In order for the \_\_\_\_\_ distribution to be used correctly, the probability of success must remain constant from trial to trial; if this assumption cannot be met, then the use of the \_\_\_\_\_ distribution is more appropriate.  
(A) Binomial; Poisson  
(B) Binomial; Hypergeometric  
(C) Hypergeometric; Binomial  
(D) Hypergeometric; Exponential  
(E) Poisson; Hypergeometric



7. A calculator manufacturer performs a test on its calculators and finds their working life to be normally distributed, with a mean of 2,150 hours and a standard deviation of 450 hours. What should the manufacturer advertise as the life of the calculators so that 90% of the calculators are covered?  
 (A) 2,555 (B) 1,947 (C) 1,410 (D) 1,745 (E) 1,574
8. The waist measurement of students in a college is normally distributed. The standard deviation is known to be five inches. It is found that 15% of the students have waist sizes less than 28 inches. What proportion of students will have waists between 30 and 35 inches?  
 (A) 0.3795 (B) 0.2389 (C) 0.1406 (D) 0.0983 (E) None of the above
9. When the probability that an estimator is close to the parameter it estimates increases as the sample size,  $n$ , increases, that estimator is said to be:  
 (A) Unbiased (B) Biased (C) Efficient (D) Consistent (E) Sufficient
10. The "no-show" rate at a popular resort hotel is 8%. If a random sample of 100 reservations is taken, what is the probability that the number of "no shows" will exceed 10?  
 (A) 0.0049 (B) 0.1788 (C) 0.2296 (D) 0.7704 (E) 0.8665

## (二) 計算題：Problems (50%)

1. (15%) Let  $X_1, X_2, \dots, X_n$  be a random sample from  $b(1, p)$ , i.e.,  $n$  Bernolli trials. If  $Y = \sum_{i=1}^n X_i$ ,
- Show that  $\bar{X} = Y/n$  is an unbiased estimator of  $p$ .
  - Find  $E[\bar{X}(1 - \bar{X})/n]$ .
  - Find the value  $c$  so that  $c\bar{X}(1 - \bar{X})$  is an unbiased estimator of  $Var(\bar{X})$ .
2. (15%) If  $Y_1/n$  and  $Y_2/n$  are the respective independent relative frequencies of successes associated with the two binomial distributions  $b(n, p_1)$  and  $b(n, p_2)$ , compute  $n$  such that the approximate probability that the random interval  $Y_1/n - Y_2/n \pm 0.05$  covers  $p_1 - p_2$  is at least 0.80.



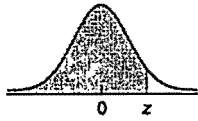
3. (20%) Use a computer software to fit a simple linear regression model to the oxygen purity (y) and hydrocarbon level (x). The output is shown in the following Table 1. Find the values of (1)~(10) in the table.

Table 1 Minitab Output for the Oxygen Purity Data

Regression Analysis					
The regression equation is					
Purity = 74.3 + 14.9 HC Level					
Predictor	Coef	SE Coef	T	P	
Constant	(1)	1.593	46.62	0.000	
HC Level	14.947	1.317	(2)	0.000	
S = 1.087		R-Sq = (3)		R-Sq (adj) = 87.1%	
Analysis of Variance					
Source	DF	SS	MS	F	P
Regression	1	(4)	152.13	(5)	0.000
Residual Error	(6)	21.25	(7)		
Total	19	(8)			
Predicted Values for New Observations					
New Obs	Fit	SE Fit	95.0% CI	95.0% PI	
1	89.231	0.354	(88.486, (9) )	( (10) , 91.632)	
Values of Predictors for New Observations					
New Obs	HC Level				
1	1.00				



TABLE II (cont.)  
Areas under the  
standard normal curve



z	Second decimal place in z									
	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998
3.5	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998
3.6	0.9998	0.9998	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.7	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.8	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.9	1.0000 <sup>†</sup>									

<sup>†</sup> For  $z \geq 3.90$ , the areas are 1.0000 to four decimal places.

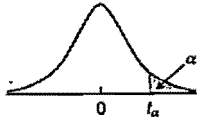


國立雲林科技大學

100 學年度碩士班暨碩士在職專班招生考試試題

系所：工管所、資管系

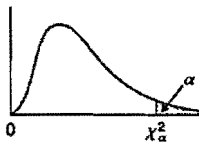
科目：統計學(1)

TABLE IV  
Values of  $t_{\alpha}$ 

df	$t_{0.10}$	$t_{0.05}$	$t_{0.025}$	$t_{0.01}$	$t_{0.005}$	df
1	3.078	6.314	12.706	31.821	63.657	1
2	1.886	2.920	4.303	6.965	9.925	2
3	1.638	2.353	3.182	4.541	5.841	3
4	1.533	2.132	2.776	3.747	4.604	4
5	1.476	2.015	2.571	3.365	4.032	5
6	1.440	1.943	2.447	3.143	3.707	6
7	1.415	1.895	2.365	2.998	3.499	7
8	1.397	1.860	2.306	2.896	3.355	8
9	1.383	1.833	2.262	2.821	3.250	9
10	1.372	1.812	2.228	2.764	3.169	10
11	1.363	1.796	2.201	2.718	3.106	11
12	1.356	1.782	2.179	2.681	3.055	12
13	1.350	1.771	2.160	2.650	3.012	13
14	1.345	1.761	2.145	2.624	2.977	14
15	1.341	1.753	2.131	2.602	2.947	15
16	1.337	1.746	2.120	2.583	2.921	16
17	1.333	1.740	2.110	2.567	2.898	17
18	1.330	1.734	2.101	2.552	2.878	18
19	1.328	1.729	2.093	2.539	2.861	19
20	1.325	1.725	2.086	2.528	2.845	20
21	1.323	1.721	2.080	2.518	2.831	21
22	1.321	1.717	2.074	2.508	2.819	22
23	1.319	1.714	2.069	2.500	2.807	23
24	1.318	1.711	2.064	2.492	2.797	24
25	1.316	1.708	2.060	2.485	2.787	25
26	1.315	1.706	2.056	2.479	2.779	26
27	1.314	1.703	2.052	2.473	2.771	27
28	1.313	1.701	2.048	2.467	2.763	28
29	1.311	1.699	2.045	2.462	2.756	29
30	1.310	1.697	2.042	2.457	2.750	30
31	1.309	1.696	2.040	2.453	2.744	31
32	1.309	1.694	2.037	2.449	2.738	32
33	1.308	1.692	2.035	2.445	2.733	33
34	1.307	1.691	2.032	2.441	2.728	34
35	1.306	1.690	2.030	2.438	2.724	35
36	1.306	1.688	2.028	2.434	2.719	36
37	1.305	1.687	2.026	2.431	2.715	37
38	1.304	1.686	2.024	2.429	2.712	38
39	1.304	1.685	2.023	2.426	2.708	39
40	1.303	1.684	2.021	2.423	2.704	40
41	1.303	1.683	2.020	2.421	2.701	41
42	1.302	1.682	2.018	2.418	2.698	42
43	1.302	1.681	2.017	2.416	2.695	43
44	1.301	1.680	2.015	2.414	2.692	44
45	1.301	1.679	2.014	2.412	2.690	45
46	1.300	1.679	2.013	2.410	2.687	46
47	1.300	1.678	2.012	2.408	2.685	47
48	1.299	1.677	2.011	2.407	2.682	48
49	1.299	1.677	2.010	2.405	2.680	49



TABLE VII  
Values of  $\chi^2_\alpha$



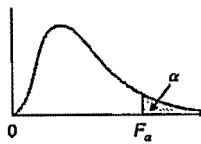
df	$\chi^2_{0.995}$	$\chi^2_{0.99}$	$\chi^2_{0.975}$	$\chi^2_{0.95}$	$\chi^2_{0.90}$
1	0.000	0.000	0.001	0.004	0.016
2	0.010	0.020	0.051	0.103	0.211
3	0.072	0.115	0.216	0.352	0.584
4	0.207	0.297	0.484	0.711	1.064
5	0.412	0.554	0.831	1.145	1.610
6	0.676	0.872	1.237	1.635	2.204
7	0.989	1.239	1.690	2.167	2.833
8	1.344	1.646	2.180	2.733	3.490
9	1.735	2.088	2.700	3.325	4.168
10	2.156	2.558	3.247	3.940	4.865
11	2.603	3.053	3.816	4.575	5.578
12	3.074	3.571	4.404	5.226	6.304
13	3.565	4.107	5.009	5.892	7.042
14	4.075	4.660	5.629	6.571	7.790
15	4.601	5.229	6.262	7.261	8.547
16	5.142	5.812	6.908	7.962	9.312
17	5.697	6.408	7.564	8.672	10.085
18	6.265	7.015	8.231	9.390	10.865
19	6.844	7.633	8.907	10.117	11.651
20	7.434	8.260	9.591	10.851	12.443
21	8.034	8.897	10.283	11.591	13.240
22	8.643	9.542	10.982	12.338	14.041
23	9.260	10.196	11.689	13.091	14.848
24	9.886	10.856	12.401	13.848	15.659
25	10.520	11.524	13.120	14.611	16.473
26	11.160	12.198	13.844	15.379	17.292
27	11.808	12.879	14.573	16.151	18.114
28	12.461	13.565	15.308	16.928	18.939
29	13.121	14.256	16.047	17.708	19.768
30	13.787	14.953	16.791	18.493	20.599
40	20.707	22.164	24.433	26.509	29.051
50	27.991	29.707	32.357	34.764	37.689
60	35.534	37.485	40.482	43.188	46.459
70	43.275	45.442	48.758	51.739	55.329
80	51.172	53.540	57.153	60.391	64.278
90	59.196	61.754	65.647	69.126	73.291
100	67.328	70.065	74.222	77.930	82.358


 TABLE VII (cont.)  
 Values of  $\chi^2_\alpha$ 

$\chi^2_{0.10}$	$\chi^2_{0.05}$	$\chi^2_{0.025}$	$\chi^2_{0.01}$	$\chi^2_{0.005}$	df
2.706	3.841	5.024	6.635	7.879	1
4.605	5.991	7.378	9.210	10.597	2
6.251	7.815	9.348	11.345	12.838	3
7.779	9.488	11.143	13.277	14.860	4
9.236	11.070	12.833	15.086	16.750	5
10.645	12.592	14.449	16.812	18.548	6
12.017	14.067	16.013	18.475	20.278	7
13.362	15.507	17.535	20.090	21.955	8
14.684	16.919	19.023	21.666	23.589	9
15.987	18.307	20.483	23.209	25.188	10
17.275	19.675	21.920	24.725	26.757	11
18.549	21.026	23.337	26.217	28.300	12
19.812	22.362	24.736	27.688	29.819	13
21.064	23.685	26.119	29.141	31.319	14
22.307	24.996	27.488	30.578	32.801	15
23.542	26.296	28.845	32.000	34.267	16
24.769	27.587	30.191	33.409	35.718	17
25.989	28.869	31.526	34.805	37.156	18
27.204	30.143	32.852	36.191	38.582	19
28.412	31.410	34.170	37.566	39.997	20
29.615	32.671	35.479	38.932	41.401	21
30.813	33.924	36.781	40.290	42.796	22
32.007	35.172	38.076	41.638	44.181	23
33.196	36.415	39.364	42.980	45.559	24
34.382	37.653	40.647	44.314	46.928	25
35.563	38.885	41.923	45.642	48.290	26
36.741	40.113	43.195	46.963	49.645	27
37.916	41.337	44.461	48.278	50.994	28
39.087	42.557	45.722	49.588	52.336	29
40.256	43.773	46.979	50.892	53.672	30
51.805	55.759	59.342	63.691	66.767	40
63.167	67.505	71.420	76.154	79.490	50
74.397	79.082	83.298	88.381	91.955	60
85.527	90.531	95.023	100.424	104.213	70
96.578	101.879	106.628	112.328	116.320	80
107.565	113.145	118.135	124.115	128.296	90
118.499	124.343	129.563	135.811	140.177	100



TABLE VIII  
Values of  $F_\alpha$



dfd	$\alpha$	dfn								
		1	2	3	4	5	6	7	8	9
1	0.10	39.86	49.50	53.59	55.83	57.24	58.20	58.91	59.44	59.86
	0.05	161.45	199.50	215.71	224.58	230.16	233.99	236.77	238.88	240.54
	0.025	647.79	799.50	864.16	899.58	921.85	937.11	948.22	956.66	963.28
	0.01	4052.2	4999.5	5403.4	5624.6	5763.6	5859.0	5928.4	5981.1	6022.5
	0.005	16211	20000	21615	22500	23056	23437	23715	23925	24091
2	0.10	8.53	9.00	9.16	9.24	9.29	9.33	9.35	9.37	9.38
	0.05	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38
	0.025	38.51	39.00	39.17	39.25	39.30	39.33	39.36	39.37	39.39
	0.01	98.50	99.00	99.17	99.25	99.30	99.33	99.36	99.37	99.39
	0.005	198.50	199.00	199.17	199.25	199.30	199.33	199.36	199.37	199.39
3	0.10	5.54	5.46	5.39	5.34	5.31	5.28	5.27	5.25	5.24
	0.05	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81
	0.025	17.44	16.04	15.44	15.10	14.88	14.73	14.62	14.54	14.47
	0.01	34.12	30.82	29.46	28.71	28.24	27.91	27.67	27.49	27.35
	0.005	55.55	49.80	47.47	46.19	45.39	44.84	44.43	44.13	43.88
4	0.10	4.54	4.32	4.19	4.11	4.05	4.01	3.98	3.95	3.94
	0.05	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00
	0.025	12.22	10.65	9.98	9.60	9.36	9.20	9.07	8.98	8.90
	0.01	21.20	18.00	16.69	15.98	15.52	15.21	14.98	14.80	14.66
	0.005	31.33	26.28	24.26	23.15	22.46	21.97	21.62	21.35	21.14
5	0.10	4.06	3.78	3.62	3.52	3.45	3.40	3.37	3.34	3.32
	0.05	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77
	0.025	10.01	8.43	7.76	7.39	7.15	6.98	6.85	6.76	6.68
	0.01	16.26	13.27	12.06	11.39	10.97	10.67	10.46	10.29	10.16
	0.005	22.78	18.31	16.53	15.56	14.94	14.51	14.20	13.96	13.77
6	0.10	3.78	3.46	3.29	3.18	3.11	3.05	3.01	2.98	2.96
	0.05	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10
	0.025	8.81	7.26	6.60	6.23	5.99	5.82	5.70	5.60	5.52
	0.01	13.75	10.92	9.78	9.15	8.75	8.47	8.26	8.10	7.98
	0.005	18.63	14.54	12.92	12.03	11.46	11.07	10.79	10.57	10.39
7	0.10	3.59	3.26	3.07	2.96	2.88	2.83	2.78	2.75	2.72
	0.05	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68
	0.025	8.07	6.54	5.89	5.52	5.29	5.12	4.99	4.90	4.82
	0.01	12.25	9.55	8.45	7.85	7.46	7.19	6.99	6.84	6.72
	0.005	16.24	12.40	10.88	10.05	9.52	9.16	8.89	8.68	8.51
8	0.10	3.46	3.11	2.92	2.81	2.73	2.67	2.62	2.59	2.56
	0.05	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39
	0.025	7.57	6.06	5.42	5.05	4.82	4.65	4.53	4.43	4.36
	0.01	11.26	8.65	7.59	7.01	6.63	6.37	6.18	6.03	5.91
	0.005	14.69	11.04	9.60	8.81	8.30	7.95	7.69	7.50	7.34