國立中山大學９５學年度碩士班招生考試試題

科目：計算機概論【資管系碩士班甲組】

複選題 （每小題 4 分）

1. Which of the following are NOT Web servers?
   A. MS IIS
   B. MS Internet Explorer
   C. Apache
   D. FreeBSD
   E. MySQL

2. Which of the following are core functions of a Database Management System (DBMS)?
   A. SQL statements processing
   B. Schema definition
   C. Software development environment
   D. Access control
   E. Web page Design
   F. None of the above

3. Which of the following are true for client-server architecture?
   A. The application program and the DBMS have to reside on the same machine.
   B. The operating systems of the application program and the DBMS platforms have to be the same.
   C. You only need to access to one machine for upgrading a given application program.
   D. The application program must be Web-based.
   E. None of the above.

4. Which of the following devices can be used to store information?
   A. Ear phone
   B. DVD ROM
   C. iPod
   D. Cable modem
   E. None of the above

5. Which of the following components can be included in a CPU chip?
   A. ALU
   B. Cache
   C. RFID
   D. DRAM
   E. None of the above

Consider the Ackermann's function as shown below for the next two questions.

$A(0, n) = n + 1$	for $n \geq 0$,
$A(m, 0) = A(m-1, 1)$	for $m > 0$,
$A(m, n) = A(m-1, A(m, n-1))$	for $m, n > 0$.

6. What is A(1, 2)?
   A. 1
   B. 2
   C. 3
   D. 4
   E. 5
   F. None of the above
7. What is A(2, 1)?
   A. 1
   B. 2
   C. 3
   D. 4
   E. 5
   F. None of the above

8. Which of the following descriptions about *set* are correct?
   A. There is an order for the elements in a set.
   B. All elements in a set must be distinct.
   C. $A \cap (B \cup C) = (A \cap B) \cup C$
   D. $A - (B \cup C) = (A - B) \cup (A - C)$
   E. None of the above

Consider two identical independent random variables X and Y for the following two questions, where X and Y are uniformly distributed in the sample space {1, 2, 3, 4, 5, 6}.

9. Let $Z = X - Y$. Which of the following are true?
   A. $Pr(Z \leq 0) \geq 0.3$
   B. $Pr(Z \leq 0) \geq 0.4$
   C. $Pr(Z \leq 0) \geq 0.5$
   D. $Pr(Z \leq 0) \leq 0.3$
   E. $Pr(Z \leq 0) \leq 0.4$
   F. $Pr(Z \leq 0) \leq 0.5$

10. Let $Z = X + Y$. Which of the following are true?
    A. $Pr(Z \leq 6) \geq 0.3$
    B. $Pr(Z \leq 6) \geq 0.4$
    C. $Pr(Z \leq 6) \geq 0.5$
    D. $Pr(Z \leq 6) \leq 0.3$
    E. $Pr(Z \leq 6) \leq 0.4$
    F. $Pr(Z \leq 6) \leq 0.5$

問答題 (**請務必將每一題的答案明顯地標示，以利評分**):

1. [10 points]
Consider the following C-like function:

```
Sort(IntegerArray A)
{
    int i, j, temp;

    for (i = 0; i < n-1; i++) {
        for (j = 0; j < n-1; j++) {
            if (A[j] < A[j+1] {
                temp = A[j];
                A[j] = A[j+1];
                A[j+1] = temp;
            }
        }
    }
}
```

   A. [5 points] Let A = {1, 3, 5, 7, 9, 2, 4, 6, 8}. What is the content of A after executing Sort(A)?
   B. [5 points] The above function can be improved to run twice as fast and still achieve the same result. You only need to modify one line of the code. What is it?

2. [10 points] A computer whose processes have 1024 pages in their address spaces keeps its page tables in memory. The overhead required for reading a word from the page table is 500 **ns** (nano seconds). To reduce this overhead, the computer has a TLB, which holds 64 (virtual page, physical page frame) pairs, and can do a look up in 100 **ns.** What hit ratio (in decimal) is needed to reduce the mean overhead to 200 **ns?** (答案請以小數方式表示)

3. [10 points] Consider the problem of providing a mobile communication service to a city. The total bandwidth available is 40MHz, and each user requires 20KHZ of bandwidth for a duplex channel (i.e. bi-directional voice communication). Suppose that the whole city is divided into 24 regions and the cellular topology is deployed where one base station is located in each region. We divide our frequency band into 4 sets and assign one set to each cell for frequency reuse. Each adjacent cell uses different set of frequency band. What is the total number of simultaneous users supported by the system?

4. [15 points] A computer has four page frames. The page id, the time of loading, the time of last access, and R (reference bit) and M (Modify bit) are shown for each page (bit "1" means "Yes") .

Page id	Load time	Last access time	R	M
1	126	279	0	0
2	240	260	1	0
3	110	271	1	1
4	150	290	1	1

A. [7 points] Which page will be replaced by the FIFO (first-in-first-out) replacement algorithm?

B. [8 points] Which page will be replaced by the LRU (least-recently-used) replacement algorithm?

5. [15 points] To find out how much slow-start limits throughput on an 4M bps Ethernet connection (MTU = 10K bits), we assume that a round-trip delay of 4 milliseconds and packets are sent in MTU. Calculate the throughput of the first 32 packets sent by using (A) [5 points] without slow-start, and (B) [10 points] slow-start.

A. Multiple Choices (2.5 points each, total 50 points)

Choose the most appropriate answer to the following questions:

1. Automated Teller Machines (ATMs) are used by most banks to provide 24-hour support to customers. The information system that runs the ATM belongs to which category?
   (1) Decision support systems, (2) e-commerce systems, (3) transaction processing systems, and (4) knowledge management systems.
2. Management decisions are often divided into three different levels: strategic planning, management control, and operational control. Which of the following is NOT a feature of strategic planning?
   (1) Long time horizon, (2) high data accuracy requirement, (3) large variety of information, (4) less need for detail data.
3. Many stock analysts on TV use stock analysis software to show the trend and other patterns of stock price movement in order to help investors find the best timing to buy and sell stocks. This kind of software is often called:
   (1) Transaction processing systems, (2) decision support systems, (3) strategic information systems, (4) object-oriented information systems.
4. Which of the following is the most proper sequence for information system planning?
   (1) Strategic IT planning, information requirement analysis, resource allocation, information project planning, (2) information requirement analysis, resource allocation, strategic IT planning, information project planning, (3) information project planning, information requirement analysis, resource allocation, strategic IT planning, (4) strategic IT planning, information requirement analysis, information project planning, resource allocation.
5. For database design, there are many different data models. One model that requires normalization and the designer needs to carefully put the design into different normal forms. Which is this data model?
   (1) Normal model, (2) object-oriented database model, (3) web-based model, (4) relational model.
6. When an organization has many different kinds of databases, integration of data from these heterogeneous databases to support decision making is a major problem. In this case, which of the following technology can help to solve the data integration problem?
   (1) Database, (2) data warehouse, (3) data mart, (4) data security.
7. Which of the following is NOT a correct description of enterprise resources planning (ERP) software?
   (1) Evolved from MRP, (2) designed in modules, (3) need to re-engineer the business process in order to gain benefits, (4) turnkey system that does not need training.
8. Which of the following is the most important element in ubiquitous computing?
   (1) Database, (2) PDA, (3) mobile phone, (4) wireless network.
9. The computing architecture that is used to support recent music sharing software such as Kuro is called:
   (1) Client/server, (2) peer to peer, (3) centralized, (4) sensor network.

10. In knowledge management, Nonaka proposed a model for knowledge creation and the activity that facilitates to convert tacit knowledge to explicit knowledge is called
(1) Externalization, (2) internalization, (3) socialization, (4) combination.
11. What kind of information systems can capture human knowledge that is represented in IF-THEN rules and store into a knowledge base to support similar decisions?
(1) Decision support systems, (2) knowledge management systems, (3) expert systems, (4) knowledge support systems.
12. A web-based application that allows the user in an organization to access both internal and external sources of information through a single gateway is called
(1) Enterprise information portal (2) Internet search engine (3) executive information systems, (4) enterprise resources planning systems.
13. In you are running a website that is often under attack by different hackers to invade into your database and change your homepage, which of the following security mechanism is appropriate for solving this problem?
(1) Encryption, (2) virus protection, (3) authentication, (4) firewall.
14. Which of the following is not a typology of computer networks?
(1) Local area networks, (2) wide area networks, (3) value added networks, (4)none of the above.
15. Web service is a new standard for computer applications over the Internet to share information and collaborate. Which of the following is the message exchange mechanism for web services.
(1) UDDI, (2) SOAP, (3) HTML, (4) CDMA.
16. Which of the following is NOT a benefit of software outsourcing?
(1) save costs, (2) gain more professional services, (3) access to newer technology, (4) none of the above.
17. A software company develops an accounting software on the Internet. The software is installed on the company's server and all customers can use the software to manage their accounting data through the Internet. This business model is called:
(1) Internet content provider, (2) Application software vendor, (3) Application service provider, (4) value-added provider.
18. A framework used frequently to analyze the role of information systems in an organization is based on two dimensions: one is the current importance of IT and another is the future potential of IT. If a company finds that IT is not important now but will be very important for the future. Which category is this company belongs to?
(1) Strategic, (2) factory, (3) turnaround, (4) support.
19. In electronic commerce, the most important success factor for a company is its business model. Which of the following is NOT a basic component of a business model?
(1) Source of revenue (who pays the money)
(2) Products and services
(3) Channels for product distribution and material procurement
(4) Distribution of owners and management styles.

20. 104.com is very successful in Taiwan and has become the top ranked human resources e-commerce company. Which of the following well-known international e-commerce companies has the same business model as 104.com?
(1) eBay.com, (2) google.com, (3) SAP.com, (4) Amazon.com

B. 問答題 (50%)

One of the competitive necessities for the Web retailer is real-time personalization (RTP). RTP works as a customer browser online and keeps track of what the customer searches for, looks at, looks back at, and possibly buys. The program uses an algorithm called *adaptive relationship modeling* that automatically creates and continually modifies a user's profile based on the clicks that he or she makes. The recommendation engine learns from customers' browser behavior and provides recommendations for items that they may want to see, or those that they may not even be aware they want to see.

Supergo Motorcycle Shops, a clicks-and-mortar company that sells all things of motorcycle, had incorporated a personalization system called BSelect into its site, but it wanted to test the program to make sure it really delivered results. To test the RTP system, Supergo switched the site's personalization function off for 24 hours to see what would happen. During this period the site randomly selected three "hot products" to feature from among 30 possibilities. When the personalization function was turned off, the click-through rate dropped 31.9 percent and the average order size dropped 14 percent. Needless to say, Supergo turned the RTP back on immediately.

The real value of an RTP system is that it doesn't have to know who you are in order to do its job. After about four or five clicks around the site, a potential customer starts to create their individual pattern as BSelcet compares their click stream to those of the thousands of others who have shopped there.

1. 什麼是顧客關係管理? (15%)
2. 請描述 BSelect 在顧客關係管理目標內所能有的貢獻。 (10%)
3. 請針對 Supergo 這樣一個虛實結合的零售商，說明該公司的成功關鍵因素，並針對成功關鍵因素提出三個你認爲有助於提昇公司營運績效的系統,並說明其貢獻所在。(25%)

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科目：統計學【資管系碩士班甲組】

1. 是非題，每題十分
   a. （以下問題涵蓋下列五個敘述，請仔細閱讀題意）
   A quality control process makes use of a sampling plan on product lots of large size. The plan is to choose n of these products in a lot at random and accept it if k or less are defective. Let p denote the defective rate in the lot.
   (a) The acceptance probability of a lot is calculated based on the binominal probability distribution, but can be approximately by the Poisson distribution if n is large and p is small.
   (b) Given a fixed n, small k value is more preferable than large k value in terms of a good plan.
   (c) If n=120 and k= 5, then the acceptance probability is above 0.95 when p=0.02, and the acceptance probability is below 0.1 when p=0.08.
   (d) If we require the acceptance probability to be above 0.95 when p=0.02, and the acceptance probability to be below 0.1 when p=0.08, then n cannot be ≤ 120.
   (e) If we require the acceptance probability to be above 0.95 when p=0.02, and the acceptance probability to be below 0.1 when p=0.08, then k cannot be ≤ 4.
   b. （以下問題涵蓋下列五個敘述，請仔細閱讀題意）
   Given some statistics of a grouped numeric data set with the original data gone, we can
   (a) obtain the exact mean of the original data if the statistics contain means of each group and the number of data in each group.
   (b) obtain the exact variance of the original data if the statistics contain means of each group and the number of data in each group.
   (c) obtain the exact mean of the original data if the statistics contain group limits of each group and the number of data in each group.
   (d) approximate the variance of the original data if the statistics contain group limits of each group and the number of data in each group.
   (e) obtain the exact variance of the original data if the statistics contain means and variances of each group, and the number of data in each group.

2. (20 分)The assumption of a normal distribution is essential for many of the statistical tools. The Central Limit Theorem allows us to accept the normal distribution assumption of the sample mean when the sample size is large enough, without knowledge of the population distribution. Let us demonstrate the Central Limit Theorem on the sampling distribution of the mean with two dice.
   (a) Define the random variable with its probability distribution for the population. Find the mean of the population distribution.
   (b) Is this population finite or infinite? Describe a simple random sample procedure for the sampling.
   (c) Describe how the result from the simple random sample can be used to estimate the population mean and how Central Limit Theorem can be applied.
   (d) What is meant by "the behavior of a single observation is different from the behavior of the mean of many observations"? What are the major differences?

3. (10 分)A street peddler buys apples each day and sells them on a street corner. He buys them at 30 cents per pound and sells them at a price of 50 cents per pound. His daily demand ranges uniformly from 0 to 400 pounds from past experience. All unsold apples at the end of the day must be sold for a salvage value of 20 cents per pound. Find the quantity of apples to buy each day to maximize the apple peddler's profits.

選擇題 （4~10 題，每題 5 分，共 35 分）

4. An airline promotion to business travelers is based on the assumption that 60% of travelers by air are for business purpose. To test whether the business-purpose travelers is 60% of total travelers or not, a company-sponsored survey found that 469 of 845 travelers by air are for business purpose. Use α=.05, which of the following statement is true?

(a) $\begin{matrix} H_0: p=.6 \\ H_a: p>.6 \end{matrix}$, H_0 is rejected.

(b) $\begin{matrix} H_0: p=.6 \\ H_a: p>.6 \end{matrix}$, H_0 can not be rejected.

(c) $\begin{matrix} H_0: p=.6 \\ H_a: p<.6 \end{matrix}$, H_0 is rejected.

(d) $\begin{matrix} H_0: p=.6 \\ H_a: p\neq.6 \end{matrix}$, H_0 is rejected.

(e) $\begin{matrix} H_0: p=.6 \\ H_a: p\neq.6 \end{matrix}$, H_0 can not be rejected.

5. A random survey of 100 students asked each student to select the most preferred computer games from 4 choices. Test whether the choice is independent of the gender of the respondent. Use α=.05.

Games

	A	B		A	B
Male	22	7	Male	22	7
Female	12	20	Female	12	20
Totals	31	24	Totals	31	24

(a) Use an F test. The test concludes different genders have different game preferences. (b) Use an F test. The test concludes the choice is independent of the gender of the respondent. (c) Use a T test. The test concludes different genders have different game preferences. (d) Use a chi-square test. The test concludes different genders have different game preferences. (e) Use a chi-square test. The test concludes the choice is independent of the gender of the respondent.

6. A random sample of size 9 from $N(\mu, 25)$, yielded $\bar{x}=32$. The 95% confidence interval for μ is
(a) (28.73, 35.27) (b) (30.33, 33.67) (c) (27,92, 36.08) (d) (29.26, 34.74) (e) None of the above.

7. The following data give the times of 12 male students racing for 100 meters. For these data, x is the running time recorded in the beginning of the semester and y is the time recorded in the end of the semester.

Students

	1	2	3	4	5	6	7	8	9	10	11	12
x	12.9	13.2	14	13.5	12.8	13.6	13.8	12.7	13.2	13.3	13.5	13
y	13	12.9	13.2	13.6	13.1	13.2	13.6	12.8	12.9	12.9	13.2	13.1
$d=x-y$	-0.1	0.3	0.8	-0.1	-0.3	0.4	0.2	-0.1	0.3	0.4	0.3	-0.1

Teacher Wang would like to test whether students have improved their running skills after a semester or not. Use α=.05, which of the following statement is true? Given the sample means and sample standard errors: $\bar{x}=13.292$, $\bar{y}=13.075$, $s_{\bar{X}}=.116$, $s_{\bar{Y}}=.064$, $s_{\bar{D}}=.0796$.

(a) $\begin{matrix} H_0: \mu_X=\mu_Y \\ H_a: \mu_X\neq\mu_Y \end{matrix}$, H_0 is rejected.

(b) $\begin{matrix} H_0: \mu_X=\mu_Y \\ H_a: \mu_X>\mu_Y \end{matrix}$, H_0 is rejected.

(c) $H_0: \mu_D = 0$, $H_a: \mu_D > 0$, H_0 is rejected. (d) $H_0: \mu_D = 0$, $H_a: \mu_D < 0$, H_0 is rejected.

(e) $H_0: \mu_D = 0$, $H_a: \mu_D \neq 0$, H_0 is rejected.

8. For the following data,

Case	1	2	3	4	5	6	7	8	9
x_i	3	4	4	5	6	7	7	8	9
y_i	4	6	3	5	4	6	8	5	11

The ANOVA table is given below.

	Degree of freedom	SS	MS	F	p-value
Regression	A	23.46096	23.46096	6.815916	0.034876
Error	B	24.09459	3.442085		
Total	C	47.55556			

(*A, B, C*) = (a) (1, 7, 8) (b) (1, 8, 9) (c) (2, 15, 17) (d) (2, 8, 10) (e) (1, 9, 10)

（以下問題敘述涵蓋選擇題的第 9 題、第 10 題，請仔細閱讀題意）

A computer magazine states that the following hypotheses about the mean age of its subscribers.

$$H_0: \mu = 25$$
$$H_a: \mu \neq 25$$

The marketing manager would like to conduct the test under a .05 level of significance. According to the historical record, $\sigma = 8$.

9. For a .15 probability of type II error is permitted when the true mean age is 26, what sample size should be selected? (a) 324 (b) 256 (c) 390 (d) 554 (e) 1068.

10. Given a random sample of size 36, if the true mean is 27, the power of the test is (a) greater than0.9 (b) between 0.7 and 0.6 (c) between 0.6 and 0.5 (d) between 0.4 and 0.3 (e) less than 0.2

計算題

11. (5 分)The amount of fluoride in a certain brand of toothpaste has a specification of 0.75-0.10 mg/g. Eighty tubes of toothpaste were selected randomly and the amounts of fluoride were measured. According to the following table that is the descriptive data, construct a box-plot and give an interpretation.

%	0	10	20	30	40	50	60	70	80	90	100
Percentile	.76	.825	.855	.875	.885	.898	.91	.92	.93	.939	.99

Note: The 0th percentile is .76, that is also the minimum of the sample; the 50th percentile is .898, that is the median of the sample.

12. (10 分) An important factor in selecting new software for file management systems is the time required to learn how to use the system. To evaluate three file management systems, a firm designed a test involving four users. Because users variability was believed to be a significant factor, each of the four users was trained on

each of the three file systems. The data obtained follow.

		System		
		A	B	C
Operator	1	6	10	20
	2	9	11	19
	3	12	14	22
	4	12	9	24

(a) Set up the ANOVA table for this problem.

(b) Use α=.05, can we reject the null hypothesis that the means of the three populations are equal?

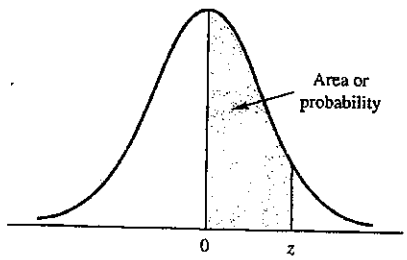
The Poisson Cumulative Probability Distribution

$\lambda = E(X)$

x	2	2.2	2.4	2.6	2.8	3	3.2	3.4	3.6	3.8	4
0	0.135	0.111	0.091	0.074	0.061	0.05	0.041	0.033	0.027	0.022	0.018
1	0.406	0.355	0.308	0.267	0.231	0.199	0.171	0.147	0.126	0.107	0.092
2	0.677	0.623	0.57	0.518	0.469	0.423	0.38	0.34	0.303	0.269	0.238
3	0.857	0.819	0.779	0.736	0.692	0.647	0.603	0.558	0.515	0.473	0.433
4	0.947	0.928	0.904	0.877	0.848	0.815	0.781	0.744	0.706	0.668	0.629
5	0.983	0.975	0.964	0.951	0.935	0.916	0.895	0.871	0.844	0.816	0.785
6	0.995	0.993	0.988	0.983	0.976	0.966	0.955	0.942	0.927	0.909	0.889
7	0.999	0.998	0.997	0.995	0.992	0.988	0.983	0.977	0.969	0.96	0.949
8	1	1	0.999	0.999	0.998	0.996	0.994	0.992	0.988	0.984	0.979
9	1	1	1	1	0.999	0.999	0.998	0.997	0.996	0.994	0.992
10	1	1	1	1	1	1	1	0.999	0.999	0.998	0.997
11	1	1	1	1	1	1	1	1	1	0.999	0.999
12	1	1	1	1	1	1	1	1	1	1	1

x	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5
0	0.011	0.007	0.004	0.002	0.002	0.001	0.001	0	0	0	0
1	0.061	0.04	0.004	0.017	0.011	0.007	0.005	0.003	0.002	0.001	0.001
2	0.174	0.125	0.027	0.062	0.043	0.03	0.02	0.014	0.009	0.006	0.004
3	0.342	0.265	0.088	0.151	0.112	0.082	0.059	0.042	0.03	0.021	0.015
4	0.532	0.44	0.202	0.285	0.224	0.173	0.132	0.1	0.074	0.055	0.04
5	0.703	0.616	0.358	0.446	0.369	0.301	0.241	0.191	0.15	0.116	0.089
6	0.831	0.762	0.529	0.606	0.527	0.45	0.378	0.313	0.256	0.207	0.165
7	0.913	0.867	0.686	0.744	0.673	0.599	0.525	0.453	0.386	0.324	0.269
8	0.96	0.932	0.809	0.847	0.792	0.729	0.662	0.593	0.523	0.456	0.392
9	0.983	0.968	0.894	0.916	0.877	0.83	0.776	0.717	0.653	0.587	0.522
10	0.993	0.986	0.946	0.957	0.933	0.901	0.862	0.816	0.763	0.706	0.645
11	0.998	0.995	0.975	0.98	0.966	0.947	0.921	0.888	0.849	0.803	0.752
12	0.999	0.998	0.989	0.991	0.984	0.973	0.957	0.936	0.909	0.876	0.836
13	1	0.999	0.996	0.996	0.993	0.987	0.978	0.966	0.949	0.926	0.898
14	1	1	0.998	0.999	0.997	0.994	0.99	0.983	0.973	0.959	0.94

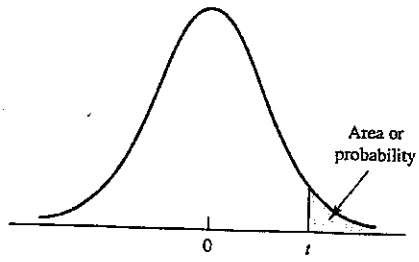
TABLE 1 STANDARD NORMAL DISTRIBUTION



Entries in the table give the area under the curve between the mean and z standard deviations above the mean. For example, for $z = 1.25$ the area under the curve between the mean and z is .3944.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

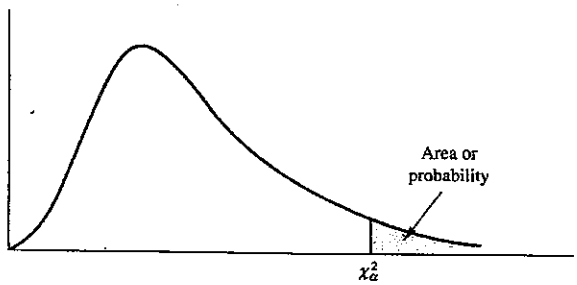
TABLE 2 t DISTRIBUTION



Entries in the table give t values for an area or probability in the upper tail of the t distribution. For example, with 10 degrees of freedom and a .05 area in the upper tail, $t_{.05} = 1.812$.

Degrees of Freedom	Area in Upper Tail					
	.20	.10	.05	.025	.01	.005
1	1.376	3.078	6.314	12.706	31.821	63.656
2	1.061	1.886	2.920	4.303	6.965	9.925
3	.978	1.638	2.353	3.182	4.541	5.841
4	.941	1.533	2.132	2.776	3.747	4.604
5	.920	1.476	2.015	2.571	3.365	4.032
6	.906	1.440	1.943	2.447	3.143	3.707
7	.896	1.415	1.895	2.365	2.998	3.499
8	.889	1.397	1.860	2.306	2.896	3.355
9	.883	1.383	1.833	2.262	2.821	3.250
10	.879	1.372	1.812	2.228	2.764	3.169
11	.876	1.363	1.796	2.201	2.718	3.106
12	.873	1.356	1.782	2.179	2.681	3.055
13	.870	1.350	1.771	2.160	2.650	3.012
14	.868	1.345	1.761	2.145	2.624	2.977
15	.866	1.341	1.753	2.131	2.602	2.947
16	.865	1.337	1.746	2.120	2.583	2.921
17	.863	1.333	1.740	2.110	2.567	2.898
18	.862	1.330	1.734	2.101	2.552	2.878
19	.861	1.328	1.729	2.093	2.539	2.861
20	.860	1.325	1.725	2.086	2.528	2.845
21	.859	1.323	1.721	2.080	2.518	2.831
22	.858	1.321	1.717	2.074	2.508	2.819
23	.858	1.319	1.714	2.069	2.500	2.807
24	.857	1.318	1.711	2.064	2.492	2.797
25	.856	1.316	1.708	2.060	2.485	2.787
26	.856	1.315	1.706	2.056	2.479	2.779
27	.855	1.314	1.703	2.052	2.473	2.771
28	.855	1.313	1.701	2.048	2.467	2.763
29	.854	1.311	1.699	2.045	2.462	2.756
30	.854	1.310	1.697	2.042	2.457	2.750
31	.853	1.309	1.696	2.040	2.453	2.744
32	.853	1.309	1.694	2.037	2.449	2.738
33	.853	1.308	1.692	2.035	2.445	2.733
34	.852	1.307	1.691	2.032	2.441	2.728

TABLE 3 CHI-SQUARE DISTRIBUTION



Entries in the table give χ^2_α values, where α is the area or probability in the upper tail of the chi-square distribution. For example, with 10 degrees of freedom and a .01 area in the upper tail, $\chi^2_{.01} = 23.209$.

Degrees of Freedom	Area in Upper Tail									
	.995	.99	.975	.95	.90	.10	.05	.025	.01	.005
1	.000	.000	.001	.004	.016	2.706	3.841	5.024	6.635	7.879
2	.010	.020	.051	.103	.211	4.605	5.991	7.378	9.210	10.597
3	.072	.115	.216	.352	.584	6.251	7.815	9.348	11.345	12.838
4	.207	.297	.484	.711	1.064	7.779	9.488	11.143	13.277	14.860
5	.412	.554	.831	1.145	1.610	9.236	11.070	12.832	15.086	16.750
6	.676	.872	1.237	1.635	2.204	10.645	12.592	14.449	16.812	18.548
7	.989	1.239	1.690	2.167	2.833	12.017	14.067	16.013	18.475	20.278
8	1.344	1.647	2.180	2.733	3.490	13.362	15.507	17.535	20.090	21.955
9	1.735	2.088	2.700	3.325	4.168	14.684	16.919	19.023	21.666	23.589
10	2.156	2.558	3.247	3.940	4.865	15.987	18.307	20.483	23.209	25.188
11	2.603	3.053	3.816	4.575	5.578	17.275	19.675	21.920	24.725	26.757
12	3.074	3.571	4.404	5.226	6.304	18.549	21.026	23.337	26.217	28.300
13	3.565	4.107	5.009	5.892	7.041	19.812	22.362	24.736	27.688	29.819
14	4.075	4.660	5.629	6.571	7.790	21.064	23.685	26.119	29.141	31.319
15	4.601	5.229	6.262	7.261	8.547	22.307	24.996	27.488	30.578	32.801
16	5.142	5.812	6.908	7.962	9.312	23.542	26.296	28.845	32.000	34.267
17	5.697	6.408	7.564	8.672	10.085	24.769	27.587	30.191	33.409	35.718
18	6.265	7.015	8.231	9.390	10.865	25.989	28.869	31.526	34.805	37.156
19	6.844	7.633	8.907	10.117	11.651	27.204	30.144	32.852	36.191	38.582
20	7.434	8.260	9.591	10.851	12.443	28.412	31.410	34.170	37.566	39.997
21	8.034	8.897	10.283	11.591	13.240	29.615	32.671	35.479	38.932	41.401
22	8.643	9.542	10.982	12.338	14.041	30.813	33.924	36.781	40.289	42.796
23	9.260	10.196	11.689	13.091	14.848	32.007	35.172	38.076	41.638	44.181
24	9.886	10.856	12.401	13.848	15.659	33.196	36.415	39.364	42.980	45.558
25	10.520	11.524	13.120	14.611	16.473	34.382	37.652	40.646	44.314	46.928
26	11.160	12.198	13.844	15.379	17.292	35.563	38.885	41.923	45.642	48.290
27	11.808	12.878	14.573	16.151	18.114	36.741	40.113	43.195	46.963	49.645
28	12.461	13.565	15.308	16.928	18.939	37.916	41.337	44.461	48.278	50.994
29	13.121	14.256	16.047	17.708	19.768	39.087	42.557	45.722	49.588	52.335

複選題 （每小題4分）

1. Which of the following are NOT Web servers?
   A. MS IIS
   B. MS Internet Explorer
   C. Apache
   D. FreeBSD
   E. MySQL

2. Which of the following are core functions of a Database Management System (DBMS)?
   A. SQL statements processing
   B. Schema definition
   C. Software development environment
   D. Access control
   E. Web page Design
   F. None of the above

3. Which of the following are true for client-server architecture?
   A. The application program and the DBMS have to reside on the same machine.
   B. The operating systems of the application program and the DBMS platforms have to be the same.
   C. You only need to access to one machine for upgrading a given application program.
   D. The application program must be Web-based.
   E. None of the above.

4. Which of the following devices can be used to store information?
   A. Ear phone
   B. DVD ROM
   C. iPod
   D. Cable modem
   E. None of the above

5. Which of the following components can be included in a CPU chip?
   A. ALU
   B. Cache
   C. RFID
   D. DRAM
   E. None of the above

Consider the Ackermann's function as shown below for the next two questions.

$A(0, n) = n + 1$ for $n \geq 0$,
$A(m, 0) = A(m-1, 1)$ for $m > 0$,
$A(m, n) = A(m-1, A(m, n-1))$ for $m, n > 0$.

6. What is A(1, 2)?
   A. 1
   B. 2
   C. 3
   D. 4
   E. 5
   F. None of the above
7. What is A(2, 1)?
   A. 1
   B. 2
   C. 3
   D. 4
   E. 5
   F. None of the above

8. Which of the following descriptions about *set* are correct?
   A. There is an order for the elements in a set.
   B. All elements in a set must be distinct.
   C. $A \cap (B \cup C) = (A \cap B) \cup C$
   D. $A - (B \cup C) = (A - B) \cup (A - C)$
   E. None of the above

Consider two identical independent random variables X and Y for the following two questions, where X and Y are uniformly distributed in the sample space {1, 2, 3, 4, 5, 6}.

9. Let $Z = X - Y$. Which of the following are true?
   A. $Pr(Z \leq 0) \geq 0.3$
   B. $Pr(Z \leq 0) \geq 0.4$
   C. $Pr(Z \leq 0) \geq 0.5$
   D. $Pr(Z \leq 0) \leq 0.3$
   E. $Pr(Z \leq 0) \leq 0.4$
   F. $Pr(Z \leq 0) \leq 0.5$

10. Let $Z = X + Y$. Which of the following are true?
   A. $Pr(Z \leq 6) \geq 0.3$
   B. $Pr(Z \leq 6) \geq 0.4$
   C. $Pr(Z \leq 6) \geq 0.5$
   D. $Pr(Z \leq 6) \leq 0.3$
   E. $Pr(Z \leq 6) \leq 0.4$
   F. $Pr(Z \leq 6) \leq 0.5$

問答題 (**請務必將每一題的答案明顯地標示，以利評分**):

1. [10 points]
Consider the following C-like function:

```
Sort(IntegerArray A)
{
    int i, j, temp;

    for (i = 0; i < n-1; i++) {
        for (j = 0; j < n-1; j++) {
            if (A[j] < A[j+1] {
                temp = A[j];
                A[j] = A[j+1];
                A[j+1] = temp;
            }
        }
    }
}
```

   A. [5 points] Let A = {1, 3, 5, 7, 9, 2, 4, 6, 8}. What is the content of A after executing Sort(A)?
   B. [5 points] The above function can be improved to run twice as fast and still achieve the same result. You only need to modify one line of the code. What is it?

2. [10 points] A computer whose processes have 1024 pages in their address spaces keeps its page tables in memory. The overhead required for reading a word from the page table is 500 **ns** (nano seconds). To reduce this overhead, the computer has a TLB, which holds 64 (virtual page, physical page frame) pairs, and can do a look up in 100 **ns.** What hit ratio (in decimal) is needed to reduce the mean overhead to 200 **ns?** (**答案請以小數方式表示**)

3. [10 points] Consider the problem of providing a mobile communication service to a city. The total bandwidth available is 40MHz, and each user requires 20KHZ of bandwidth for a duplex channel (i.e. bi-directional voice communication). Suppose that the whole city is divided into 24 regions and the cellular topology is deployed where one base station is located in each region. We divide our frequency band into 4 sets and assign one set to each cell for frequency reuse. Each adjacent cell uses different set of frequency band. What is the total number of simultaneous users supported by the system?

4. [15 points] A computer has four page frames. The page id, the time of loading, the time of last access, and R (reference bit) and M (Modify bit) are shown for each page (bit "1" means "Yes") .

Page id	Load time	Last access time	R	M
1	126	279	0	0
2	240	260	1	0
3	110	271	1	1
4	150	290	1	1

A. [7 points] Which page will be replaced by the FIFO (first-in-first-out) replacement algorithm?

B. [8 points] Which page will be replaced by the LRU (least-recently-used) replacement algorithm?

5. [15 points] To find out how much slow-start limits throughput on an 4M bps Ethernet connection (MTU = 10K bits), we assume that a round-trip delay of 4 milliseconds and packets are sent in MTU. Calculate the throughput of the first 32 packets sent by using (A) [5 points] without slow-start, and (B) [10 points] slow-start.

國立中山大學95學年度碩士班招生考試試題

科目：資料結構【資管系碩士班乙組】

1. Please transform the following expression into postfix. (5%)
   (A + B) * (C ^ (D - E) + F) – G

2. Please transform the following expression into infix. (5%)
   ABCDE - + ^ * EF * -

3. Please write a recursive C program to find the kth smallest element of an array A of numbers by choosing A[i] of A and partitioning A into those elements smaller than A[i], equal to A[i], and greater than A[i]. (20%)

4. Prove that the leftmost node at level n in an almost complete strictly binary tree is assigned the number 2^n. (10%)

5. Show the result of inserting 3, 1, 4, 6, 9, 2, 5, 7 into an initially empty binary search tree. (10%)

6. 填充題 (7%)

下列程式片段，將 A 矩陣乘上 B 矩陣，結果放入 C 矩陣內。請填入一個程式 statement。

```
for (i=0; i< m; i++)
  for (j=0; j <p; j++)
    { c[i][j] = 0;
      for (k = 0; k < n; k++)
            [          ]
}
```

7. 填充題 (7%)

下列程式片段，爲堆疊的 push 運算。請填入一個程式 statement。

```
#define maxsize 300;
int stack[maxsize];
int top = 1;
void push(int element)
{ if (IsFull( )) stackFull( );
  [          ]
}
```

8. 填充題 (7%)

下列程式片段，爲堆疊的 pop 運算。請填入一個程式 statement。

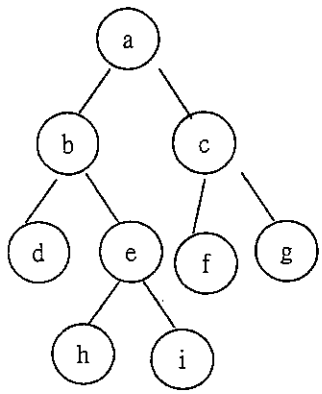
```
#define maxsize 300;
int stack[maxsize];
int top = 1;
void pop()
{ if (IsEmpty( ))
     (StackEmpty( );
      return –1;}
      [                              ]
}
```

9. 填充題 (7%)

下列程式片段，爲反向串接一串列。請填入一個程式 statement。

```
struct Node
{ int data;   struct Node * link;};
struct Node *first;
void Invert ( );
{struct Node *r, *s, *t;
  r= first;   s= NULL;
  while (r != NULL)
    { t = s;        s = r;        r = r ->link;
      [                              ]
    }
    first = s;}
```

10. 填充題 (7%)



上述二元樹的後序(Postfix)表示法爲

[ ]

11. 填充題 (7%)

下列程式片段，爲階乘函數的計算。請填入一個程式 statement。

```
Int fac(int n)
{
    [ ]
    return n * fac(n – 1);
}
```

12. 填充題 (8%)

下列程式片段，可以計算出圖形 G=(V, E), V={0,1,2,3,…, n-1},相鄰矩陣 w[i][j], 0<=i, j <= n-1 的任何兩點間的最短距離矩陣 A。請填入一個程式 statement，此 statement 可以使用 min( )函數 whose 功能爲取兩數之中較小者。

```
for (i=0; i <n; i++) do
   for (j=0; j <n; j++) do A[i][j] = w[i][j];
for (p=0; p <n; p++) do
   for (i=0; i <n; i++) do
      for (j=0; j <n; j++) do
          [ ]
```