



In this test, there are 25 multiple choice questions with 4 points for each question. Please select the correct answer for each question.

請依題號作答並將答案寫在答案卷上，違者不予計分。

- Roll a fair six-sided die three times. Let $A = \{1 \text{ or } 2 \text{ on the first roll}\}$, $B = \{3 \text{ or } 4 \text{ on the second roll}\}$, and $C = \{5 \text{ or } 6 \text{ on the third roll}\}$. What is the probability of $A \cup B \cup C$?
(A) 0.5 (B) 0.6329 (C) 0.6634 (D) 0.7037 (E) 0.7634
- Suppose that there are 12 songs on a compact disk (CD) of which two are your favorites. When using the random button selector on a CD player, each of the 12 selections is played once in a random order. What is the probability that the second of your two favorites (i.e., one has already been played) is the third song that is played?
(A) 0.0202 (B) 0.0303 (C) 0.0404 (D) 0.5 (E) 0.0607
- A drawer contains four black, six brown, and eight olive socks. Two socks are selected at random from the drawer. What is the probability that both socks are olive if it is known that they are the same color?
(A) 0.3321 (B) 0.4469 (C) 0.5 (D) 0.5714 (E) 0.6438
- A package, say A , of 24 crocus bulbs contains 8 yellow, 8 white, and 8 purple crocus bulbs. A package, say B , of 24 crocus bulbs contains 6 yellow, 6 white, and 12 purple crocus bulbs. One of the two packages is selected at random. If 3 bulbs yielded 1 yellow flower, 1 white flower, and 1 purple flower, what is the conditional probability that package A was selected?
(A) 0.4629 (B) 0.5 (C) 0.5424 (D) 0.5838 (E) 0.6241
- Given that $E(X+4) = 10$ and $E[(X+4)^2] = 116$. What is the standard deviation of X ?
(A) 4 (B) 8 (C) 12 (D) 16 (E) 20
- The probability density function of a random variable Y is $f(y) = k/y^3$, for $1 < y < \infty$. What is the value of k ?
(A) 0.5 (B) 1.0 (C) 1.25 (D) 1.5 (E) 2.0



7. A random variable X has a binomial distribution with mean 6 and variance 3.6. What is the probability that $X = 4$?
- (A) 0.1059 (B) 0.1268 (C) 0.1493 (D) 0.1625 (E) 0.1842
8. One of four different prizes was randomly put into each box of a cereal. If a family decided to buy this cereal until it contained at least one of each of the four different prizes, what is the expected number of boxes of cereal that must be purchased?
- (A) 6.33 (B) 7.33 (C) 8.33 (D) 9.33 (E) 10.33
9. Flaws in a certain type of drapery material appear on the average of one in 150 square feet. If the Poisson distribution is assumed, what is the probability of at most one flaw in 225 square feet?
- (A) 0.375 (B) 0.417 (C) 0.462 (D) 0.509 (E) 0.558
10. Let the random variable X have an exponential distribution with density function $f(x) = \lambda e^{-\lambda x}$, for $x > 0$, and the random variable $Y = 1 - e^{-\lambda X}$. What is the variance of Y ?
- (A) 0.0833 (B) 0.1056 (C) 0.1424 (D) 0.1839 (E) 0.2061
11. If the moment-generating function of X is $M_X(t) = (1-t)^{-2}$, for $t < 1$, what is the variance of X ?
- (A) 1 (B) 2 (C) 4 (D) 6 (E) 8
12. Suppose that the length of life in hours, say X , of a light bulb manufactured by company A is normally distributed with mean 800 hours and variance 14400 (hours)², and the length of life in hours, say Y , of a light bulb manufactured by company B is normally distributed with mean 850 hours and variance 2500 (hours)². One bulb is selected from each company and burned until "death." What is the probability that the length of life of the bulb from company A exceeds the length of life of the bulb from company B by at least 15 hours?
- (A) 0.2267 (B) 0.24 (C) 0.2673 (D) 0.2829 (E) 0.3085



13. A confidence interval was used to estimate the proportion of statistics students that are females. A random sample of 72 statistics students generated the following 90% confidence interval: (0.438, 0.642). Using the information above, what size of sample would be necessary if we wanted estimate the true proportion within 8% using 95 % reliability?

(A) 105 (B) 150 (C) 271 (D) 420 (E) 597

14. Let X_1, X_2, \dots, X_5 be a random sample of size 5 from $N(0, \sigma^2)$. Find the constant C so that $C(X_1 - X_2) / \sqrt{X_3^2 + X_4^2 + X_5^2}$ has a t-distribution.

(A) 0.5 (B) 0.6667 (C) 0.8165 (D) 1.2247 (E) 1.5

15. The coefficient of variation (C.V.) for a sample of values Y_1, Y_2, \dots, Y_n is defined by

$$C.V. = S/\bar{Y}.$$

This quantity is sometimes informative. For example, the value $S=10$ has little meaning unless we can compare it to something else. If S is observed to be 10 and \bar{Y} is observed to be 1000, the amount of variation is small relative to the size of the mean. However, if S is observed to be 10 and \bar{Y} is observed to be 5, the variation is quite large relative to the size of the mean. Let Y_1, Y_2, \dots, Y_{10} denote a random sample of size ten from a normal distribution with mean 0 and variance σ^2 . Find the number c such that

$$P(-c \leq \frac{S}{\bar{Y}} \leq c) = 0.95.$$

(A) 0.95 (B) 5.12 (C) 10 (D) 24.05 (E) 49.04

16. Which of the following problems associated with multicollinearity?

(A) The correlations among the independent variables cause inferences made on the response variable to have extremely large sampling errors.
 (B) The estimated regression coefficients tend to have very large sampling errors.
 (C) The estimated k^{th} regression coefficient for the k^{th} independent variable may vary substantially depending on which other independent variables are included in the model.
 (D) Answers (A), (B) and (C) are all correct.
 (E) Answers (B) and (C) are both correct.



The next 3 problems are referred to the following setting:

A local tennis pro-shop strings tennis rackets at the tension (pounds per square inch) requested by the customer. Recently a customer made a claim that the pro-shop consistently strings rackets at lower tensions, on average, than requested. To support this claim, the customer asked the pro shop to string 36 new rackets at 55 pounds per square inch (psi). Upon receiving the rackets, the customer measured the tension of each and calculates the following statistics:
 $\bar{x} = 54$ psi. and $s^2 = 5$ psi.

17. Set up the null hypothesis and the alternative hypothesis for testing the claim.
- (A) $H_0: \mu = 54$ vs. $H_a: \mu > 54$
 (B) $H_0: \mu = 55$ vs. $H_a: \mu < 55$
 (C) $H_0: \mu = 55$ vs. $H_a: \mu \neq 55$
 (D) $H_0: \bar{x} = 54$ vs. $H_a: \bar{x} < 54$
 (E) $H_0: \mu = 54$ vs. $H_a: \mu < 54$
18. Find the observed significance level for the desired test.
- (A) 0.0037 (B) 0.0885 (C) 0.1736 (D) 0.3264 (E) 0.4963
19. What is the power of the test if the mean tension is 54 pounds psi?
- (A) 0.3531 (B) 0.5 (C) 0.8032 (D) 0.8531 (E) 0.9963

The next 2 problems are referred to the following setting:

Hoping for a larger share of the fine food market, researchers for a mean-processing firm that prepares meats for exclusive restaurants are working on improve the quality of its hickory-smoked hams. One of their studies concerns the affect of time spent in the smokehouse on the flavor of hams. Hams kept in the smokehouse for varying amounts of time were tasted by a panel of 10 food experts. The following model was thought to be appropriate by the researchers:

$$E(y) = \beta_0 + \beta_1 t + \beta_2 t^2$$

where y = mean of the taste scores for 10 experts, and t = time in the smokehouse (in hours). Using a sample of 20 hams, the following least squares model was obtained:

$$\hat{y} = 20.3 + 5.2t - .0025t^2, \text{ where } R^2 = .79$$



20. Which of the following values represents the test statistic for determining if the model is a useful predictor of the mean taste score?
(A) 31.98 (B) 5.2 (C) 3.76 (D) 0.79 (E) -0.0025
21. Which of following interpretations of coefficient of determination is correct?
(A) The model explains about 79% of the variation in mean taste scores of the hams sampled.
(B) We are 79% confident that the model is statistically useful for predicting mean taste scores.
(C) Mean taste scores is moderately correlated with time in the smokehouse.
(D) When hams are kept in the smokehouse for one more hour, the estimated taste score would increase by 79%.
(E) The correlation between time that hams were kept in the smokehouse and mean taste score is about 88%.

The next 2 problems are referred to the following setting:

An operation manager is interested in modeling $E(y)$, the expected length of time per month (in hours) that a machine will be shut down for repairs as a function of age of machine, x_1 (in years), and type of machine (A and B). 20 machines were selected and the following model was fit to the data.

$$E(y) = \beta_0 + \beta_1 x_1 + \beta_2 x_1^2 + \beta_3 x_2 + \beta_4 x_1 x_2 + \beta_5 x_1^2 x_2 \text{ where}$$

y = downtime (in hours)

x_1 = age of machine (in years)

$x_2 = 1$ if machine A, 0 if not.

22. What null hypothesis would you test if the relationship between downtime and age of machines are two parallel curves?
(A) $H_0 : \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$
(B) $H_0 : \beta_2 = \beta_4 = \beta_5 = 0$
(C) $H_0 : \beta_3 = \beta_4 = \beta_5 = 0$
(D) $H_0 : \beta_4 = \beta_5 = 0$
(E) $H_0 : \beta_2 = \beta_3 = 0$



23. What null hypothesis would you test to determine whether the rate of downtime with the age of machines is different for two types of machines?
- (A) $H_0 : \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$
 (B) $H_0 : \beta_2 = \beta_4 = \beta_5 = 0$
 (C) $H_0 : \beta_3 = \beta_4 = \beta_5 = 0$
 (D) $H_0 : \beta_4 = \beta_5 = 0$
 (E) $H_0 : \beta_2 = \beta_3 = 0$

The next 2 problems are referred to the following setting:

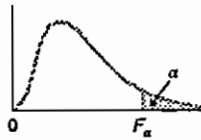
Three different washing solutions are being compared to study their effectiveness in retarding bacteria growth in five-gallon milk containers. The analysis is done in a laboratory, and only three trials can be run on any day. Because days could represent a potential source of variability, the experimenter decides to use a randomized block design. The number of bacteria was observed for four days, and part of ANOVA Table was given below:

Source	DF	SS
Solution	2	703.50
Day	3	1106.92
Error	6	51.83

24. Which of following is called the treatment in this experiment?
- (A) Days
 (B) Solutions
 (C) Five-gallon milk containers
 (D) Number of bacteria
 (E) Block
25. Which of the following values represents the test statistic for determining whether or not the mean number of bacteria differs for the three solutions at $\alpha = .05$?
- (A) 51.83 (B) 42.70 (C) 40.72 (D) 8.64 (E) 5.14



TABLE VIII
Values of F_α



dfd	α	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



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壹、選擇題(50%)

1. An _____ is all components that work together to process data and produce information.

(1). Information and systems, (2) Subsystems, (3) Information system,
(4). Information management.

2. A company achieves advantage by using strategy to maximize its strengths, resulting in a competitive advantage. So, an IS that help an organization outperform its competitors is called a _____.

(1). Executive Information Systems, (2). Decision Support Systems,
(3). Electronic Meeting Systems, (4). Strategy Information Systems.

3. Companies from different industries can help each other gain advantage by offering combined packages of goods or services at special prices. This business activities is called the _____.

(1). Cooperation, (2). Contract partner, (3). Reputation, (4). Alliances.

4. Sometimes, to implement an SIS and achieve competitive advantage, organizations must rethink the entire way they operate. Management consultants call changes such as these _____. It's often involves adoption of new machinery and elimination of management layers. Frequently, information technology plays an important role in this process.

(1). Reengineering, (2). Alliances, (3). Innovation, (4). Brainstorm.

5. In recent years, many corporations have opted to replace their disparate ISs with a single integrated system. Rather than using an IS, or several ISs, in each business function, all business functions are served by one system that supports different activities for different departments. Such systems are often called _____ systems.

(1). SCM, (2). ERP, (3). MRP, (4). CRM.



6. In business, _____ refers to the process of a group of colleagues meeting and working collaboratively to generate creative solutions and new ideas.

(1). Meeting. (2) DSS, (3). Brainstorming, (4). Virtual enterprises.

7. _____ software (programs used to prepare text documents) is the most widely used non-Web software, almost completely replacing the typewriter in the workplace.

(1). CPU, (2). Word processors, (3). Micro-processors, (4). OOP.

8. _____ includes programs that are designed to carry out general routine operations, such as the interface between user and computer, loading a file, copying a file, or deleting a file, as well as managing memory resources and operating peripheral equipment such as monitors and printers.

(1). System software. (2). Operating systems, (3). Application software, (4). Packaged software.

9. A _____ is a combination of public and private lines. To allow employees, customers, and suppliers access to its network, an organization can connect it to the largest of all public networks, the Internet.

(1). ISDN, (2). WAN, (3). VPN, (4). Extranet.

10. A _____ is like human language and basic understanding. Human beings make certain gestures when they start a conversation, and certain words signal its end. Each element of the language, be it English, French, or German, means the same thing to all parties who speak that language. Computers, too, need an agreed-upon set of rules to communicate.

(1). Protocols, (2). Network protocols, (3). WAN protocols, (4). Microwaves..



11. ____ is the combination of activities involved in gathering, organizing, sharing, analyzing, and disseminating knowledge to improve an organization's performance.
- (1). Knowledge management, (2). Information management,
(3). Data management, (4). Organization management.
12. ____ make decisions that affect the entire organization, or large parts of it, and leave an impact in the long run. For example, such decisions may include merging with and acquiring other companies, opening branches overseas, developing a completely new product or service, moving operations to the Internet, or recommending a major restructuring of an organization.
- (1). Operational management, (2). Tactical management,
(3). Strategic management, (4). Knowledge management.
13. ____ applications are designed to let a user virtually rotate cubes of information, whereby each side of the cube provides another two dimensions of relevant information.
- (1). Online analytical processing, (2). Data mining,
(3). Graphical representation, (4). Data warehouse.
14. With____, an organization can enjoy the benefits of both decentralized and centralized architectures. Each unit enjoys sufficient independence in selecting and implementing its own system to optimize its operation, but it can also share resources remotely with other units through communications lines.
- (1). Centralized information systems, (2). Parallel database systems,
(3). Decentralized information systems, (4). Data warehouse systems.
15. ____ is a title that started to pop up in the mid-1990s. The position is most often found in large companies, especially in knowledge-intensive ones, such as consulting firms and companies that rely heavily on intellectual property. It is responsible for coping with the daunting challenge of accumulating, organizing, and retrieving knowledge.
- (1). CKO, (2). CEO, (3). CIO, (4). CTO.



16. _____ applications streamline operations throughout the chain, from supplies to customers, lowering inventories, decreasing production costs, and improving responsiveness to suppliers and clients.
- (1). CRM, (2). ERP, (3). SCM, (4). MRP.
17. Often, business decisions are made by a group of managers rather than a single person. _____ are usually installed in conference-room settings or through a group of networked computers.
- (1). Electronic meeting system, (2). EIS, (3). DSS, (4). GDSS.
18. Rather than containing a set of IF-THEN rules, more sophisticated ESs use programs called _____, which are designed to mimic the way a human brain operates-the way it links facts, draws conclusions, and uses experience to learn and to understand how new facts relate to each other.
- (1). Neural networks, (2). Fuzzy logic, (3). Genetic algorithm, (4). Intelligent agents.
19. It takes more than a good programmer to construct an ES. A _____ is a programmer who specializes in developing ESs.
- (1). Database engineer, (2). Network engineer, (3). Knowledge worker, (4). Knowledge engineer.
20. In the system analysis process, the most accurate method of economic analysis is _____, which is a calculation of the difference between the stream of benefits and the stream of costs over the life of the system, discounted by the applicable interest rate.
- (1). EPS, (2). NPV, (3). ROI, (4).ROE.



貳、問答題(50%)

- 1. Describe briefly what the digital firm, electronic business, and electronic commerce are, and compare the relationship among them.**
- 2. Why are organizations trying to integrate their business processes? What are the major enterprise applications for organization-wide process integration?**
- 3. Describe the types of competitive strategies and information systems that can be used at the business, firm, and industry level.**
- 4. Give examples to explain the difference between a data-driven DSS and a model-driven DSS?**
- 5. Describe the capabilities of data warehouse, online analytical processing (OLAP), and data mining, based on their applications in customer relationship management systems.**



請依題號作答並將答案寫在答案卷上，違者不予計分。

一、選擇題：(每題兩分)

1. A database schema is
 - (a) the content of the database
 - (b) a description of the database using a specific data model
 - (c) the collection of related data
 - (d) the state of a database

2. Which of the following is NOT a function of a DBA?
 - (a) transaction management
 - (b) schema definition
 - (c) back up
 - (d) security and authorization

3. Which one of the following statements is FALSE?
 - (a) The Entity-Relationship model is a conceptual data model.
 - (b) Each regular entity type must have a key attribute.
 - (c) An entity type can have more than one key attribute.
 - (d) A key attribute can have NULL as its value.

4. If an entity type has a multivalued attribute, then:
 - (a) there are many valid values for that attribute
 - (b) each entity of this type can have one of several values for that attribute
 - (c) each entity of this type has more than one value for that attribute
 - (d) there are some entities of this type that have more than one value for that attribute

5. Integrity constraints defined for specializations are
 - (a) participation and disjointness
 - (b) completeness and disjointness
 - (c) key constraint and disjointness
 - (d) participation and completeness

6. A prime attribute is an attribute of
 - (a) a secondary key
 - (b) the primary key
 - (c) a foreign key
 - (d) any candidate key

7. Every value in a relation must be
 - (a) simple
 - (b) not null and single-valued
 - (c) composite and single-valued
 - (d) simple and single-valued



8. A superkey is
- the set of all attributes belonging to any candidate key
 - the set of attributes that has a unique value for each tuple in the relation
 - the primary key plus the secondary key
 - a minimal set of attributes that has a unique value for each tuple of the relation
9. Union compatible relations are those that have:
- the same number of attributes, where each pair of corresponding attributes shares the same domain
 - the same degree
 - the same domains for attributes
 - the same cardinality and the same domains for attributes
10. Which of the following data types would be suitable for an attribute that stores students' user codes, given that we know they consist of three letters followed by two or three digits?
- NUMBER(3,3)
 - VARCHAR(6)
 - CHAR(6)
 - CLOB
11. A SQL SELECT statement contains a nested query in the WHERE clause, comparing the value of an attribute to the values returned by the nested SELECT with an IN predicate. Which of the following predicates can be used in that statement instead of IN?
- = SOME
 - = ALL
 - = ANY
 - = EVERY
12. Two tables are given: STUDENT(StudNo, Name, Department) and GRADES(StudNo, Course, Grade). Which of the given SQL statements will retrieve the names of students who got an A in each course they passed?
- ```
SELECT name
FROM student
WHERE NOT EXISTS (SELECT *
 FROM grades
 WHERE grade IN ('B','C') and
 student.studno=grades.studno);
```
  - ```
SELECT name
FROM student JOIN grades ON student.studno=grades.studno
WHERE grade='A';
```
 - ```
SELECT name
FROM student,grades
WHERE grade='A' and student.studno=grades.studno;
```
  - ```
SELECT name
FROM student
WHERE 'A' = ALL ( SELECT grade
```



```
FROM grades
WHERE student.studno=grades.studno);
```

13. What is the difference between static and dynamic Embedded SQL?
- Static ESQL cannot modify the database, while Dynamic ESQL can.
 - In Static ESQL, the user may enter the constants to be used in search conditions, but the other elements of a query (such as table and attribute names etc) are known in advance. In Dynamic ESQL, the user may specify the table names, attribute names and other elements too.
 - A static ESQL statement never changes. A Dynamic ESQL statement may change with the user input, by using variables in queries.
 - In static ESQL, all elements of a query (including constants) are available when the application is developed. In dynamic ESQL, the user may enter values to be used in SQL statements.
14. Which one of the following statements is true?
- SQL is a procedural language.
 - A view defined over a single table is always updatable.
 - Attribute names used in a subquery are assumed to come from tables used in the nested query.
 - The INSERT statement can add only one tuple to a table.
15. Relation $R(A, B, C, D, E)$ is given, as well as a set of functional dependencies $F = \{AB \rightarrow CE, B \rightarrow D, D \rightarrow A\}$. Which of the following functional dependencies cannot be inferred from F ?
- $AD \rightarrow CE$
 - $AB \rightarrow A$
 - $B \rightarrow E$
 - $BC \rightarrow DE$
16. Local DNS name servers
- obtain resource records from Web caches
 - cache resource records and never discard them
 - cache resource records, but discard them after a period of time that is on the order of a few days
 - never cache resource records
17. The stop-and-wait protocol is highly inefficient
- when there is a large distance between source and destination and the transmission rate is high
 - when there is a short distance between source and destination and the transmission rate is low
 - when there is a short distance between source and destination and the transmission rate is large
 - when there is a large distance between source and destination and the transmission rate is low



18. TCP applies fast retransmit to a segment when
 - (a) the segment's timer expires
 - (b) it estimates unusually large RTTs
 - (c) when it receives three ACKs for an earlier segment
 - (d) none of the above

19. In routing among ASs, which of the following issues dominants:
 - (a) policy
 - (b) current congestion levels in the ASs
 - (c) geographical distance between ASs
 - (d) number of ASs traversed

20. In a high-performance router, shadow copies of the routing table are kept in
 - (a) the input ports
 - (b) the switching fabric
 - (c) the output ports
 - (d) all of the above

21. Suppose one IPv6 router wants to send a datagram to another IPv6 router, but are connected together by intervening IPv4 routers. If the two routers use tunneling, then
 - (a) The sending IPv6 router creates an IPv6 datagram and puts it in the data field of an IPv4 datagram.
 - (b) The sending IPv6 router creates an IPv4 datagram and puts it in the data field of an IPv6 datagram.
 - (c) The sending IPv6 router one or more IPv6 fragments, none of which is larger than the maximum size of an IPv4 datagram.
 - (d) None of the above

22. An ARP query packet is encapsulated in
 - (a) a link-layer frame addressed to a specific adapter
 - (b) a link-layer broadcast frame
 - (c) an IP datagram
 - (d) none of the above

23. In the Ethernet CSMA/CD protocol, suppose a node constructs a frame and then senses the channel as busy. Then
 - (a) the adapter enters exponential backoff.
 - (b) the adapter begins to transmit the frame.
 - (c) the adapter waits until it senses the channel idle and then begins to transmit the frame.
 - (d) none of the above

24. A 10BaseT Ethernet LAN has
 - (a) a linear topology (i.e., a bus)
 - (b) a ring topology
 - (c) a star topology
 - (d) none of the above



25. A cut-through switch has which of the following properties:
- (a) does not provide a performance improvement over store and forwarding if the output links are always congested
 - (b) a packet can be leaving and entering the switch at the same time
 - (c) a packet is forwarded through the switch without a store-and-forwarding delay when the output link is free
 - (d) all of the above

二、What is the equivalent assignment statement of the following assembly program?

```
LAD B ; load
ADD C ; addition
STA T1 ; store
LDA A ;
DIV T1 ; divide
STA T2 ;
MUL T2 ; multiply
ADD T1 ;
STA E ;
```

(15 分)

三、If a machine required a minimum of one second to sort a list of 100 names using the quick sort algorithm, how long do you expect it to take to sort 1000 names?

(15 分)

四、Describe the differences between a compiler and an interpreter. Compare their advantages and disadvantages.

(10 分)

五、假設某個計算機以 36 位元代表一個浮點數，其中指數部分佔 8 位元，數值部分佔 27 位元，則此計算機能表示之浮點數的大小範圍及十進制的有效位數有幾位？(假設基底為二進位)

(10 分)



請依題號作答並將答案寫在答案卷上，違者不予計分。

一、解釋名詞：(20%)

- a. Business Intelligence
- b. Portal
- c. CRM
- d. Data Mining

二、申論題：(80%)

- a. 下列第一題為必選題，二、三、四、五題任選二題，多答不計分。
- b. 作答時，請註明原題號。

1. 最著名的管理大師彼得·杜拉克在其著作《下一個社會》探討新出現的資訊革命和正在變化的世界趨勢，面對這些創造新社會的重大變化，將會是經理人未來的主要工作。試以資訊經理人(CIO)的角度，探討未來企業存活的五大關鍵要素為何？請並分別加以論述。(20%)
2. 資訊應用知能已是現代國民必需具備的素養，應用網路輔助學習亦是不可擋的趨勢，如何開發不同年齡階層的網路資訊閱讀與生產能力，是政府『挑戰2008：國家發展重點計畫』中『建構全民網路學習系統』的一項重點。試以學術機構教師的角度，探討網路學習系統其實施重要的策略為何？其主要的應用範圍又為何？請加以論述(30%)
3. 何謂XML？XML等相關技術是否會影響組織資訊系統的開發與運作？有哪些影響？為什麼？（請加以論述或舉例說明，譬如XML如何影響KM的運作）(30%)
4. 由於資訊與通訊技術的持續進步，讓世界的經濟體系由傳統快速邁向數位經濟(Digital Economy)時代。數位經濟比傳統經濟法則更強調資訊、知識、品質與速度，企業經營益漸重視將資源投注在資訊與知識密集的企業活動，並運用網路與通訊技術將資訊及知識以數位化的形式創造、傳遞及儲存，並與顧客及合作夥伴間形成緊密之合作關係，以提昇整體產業供應鏈之競爭力。而國內企業面對市場的競爭與政府的助力，亦大舉進行產業電子化，試問以產業整體的角度，何謂產業電子化？產業電子化的主要應用範圍為何？當進行產業電子化是否有所優先順序的考量？如有，其順序為何？請並分別加以論述。(30%)
5. 從最近公佈的資訊安全報告指出，去年下半年全球有超過八成的網路攻擊活動，是來自前十大攻擊來源國家或地區。其中，台灣在去年下半年的排名由上半年的第十二名上升到第八名；而美國、加拿大與中國大陸則是位居前三。台新及富邦銀行傳出網路銀行的客戶帳號，被駭客利用客戶的電子郵件植入木馬程式，竊取密碼而盜領的犯罪案例。近日也發生104人力銀行控告1111人力銀行冒名進入104資料庫竊取資料案。相類似之種種網路犯罪事件層出不窮，因此各公司資訊部門應如何因應，才能幫公司做好防護措施？請加以論述(30%)



請依題號作答並將答案寫在答案卷上，違者不予計分。

一、True/False Questions 是非題：每題 1 分

1. ____ A sound card digitizes analog sound signals.
2. ____ RISC technology can be found in some of the most powerful network servers and workstations.
3. ____ A parallel interface can handle more data than a serial interface.
4. ____ Type I PC cards are used for network adapters.
5. ____ If a LAN uses TCP/IP protocols, it requires a gateway to connect to the Internet.
6. ____ PNG is a standard vector format.
7. ____ Carpal tunnel syndrome is an eye injury.
8. ____ An INI file contains information in an indexed and cross-linked format.
9. ____ OLE allows users to cut data from one type of application and paste to another without losing the formatting.
10. ____ IPX/SPX is the protocol of the Internet as well as many other operating systems.
11. ____ Systems design is the first phase of the systems development life cycle.
12. ____ An IRQ is a preprogrammed set of steps that the CPU follows.
13. ____ A 4GL uses a text environment or a visual environment.
14. ____ EBCDIC is an 8 bit code that defines 256 symbols.

二、Matching Questions 配合題：每題 1.5 分

Part I :

- | | | |
|-----------------------|------------------|--------------------------|
| A. Microsoft Exchange | B. Bus topology | C. Microsoft .Net Server |
| D. Mesh topology | E. Fast Ethernet | F. Star topology |
| G. Token Ring | H. Ring topology | |

1. ____ All nodes and peripheral devices are connected in a series to a cable
2. ____ Newest component of the Windows network operating systems
3. ____ A hub is placed in the center of the network, and all nodes are connected to the hub
4. ____ Also referred to as 100Base-T
5. ____ A cable runs from every computer to every other computer
6. ____ Connects the network nodes in a circular chain
7. ____ IBM network technology
8. ____ An example of groupware



Part II :

- | | | |
|-----------------|----------------------|-----------------|
| A. Class | B. Class inheritance | C. Data numbers |
| D. Software | E. Class functions | F. Subclasses |
| G. Program file | H. Program | |

9. _____ A division of classes
10. _____ Represented as methods
11. _____ Class attributes
12. _____ Concept of object-oriented programming
13. _____ Contains commands that tell the computer what to do
14. _____ Typically composed of a main module and submodules
15. _____ Tendency of subclasses to share attributes and functions of the parent class
16. _____ Describes an operating system or application

Part III :

- | | | |
|--------------|------------------------|--------------|
| A. Prototype | B. ActiveX | C. Front end |
| D. C++ | E. SGL | F. Flash |
| G. Compiler | H. Macromedia Director | |

17. _____ Object-oriented implementation of C
18. _____ Interface to an application that hides the program from the user
19. _____ Microsoft equivalent to JAVA
20. _____ Translates source code into machine language
21. _____ Development tool for creating sophisticated Web pages
22. _____ Sample of an application before the code is finished
23. _____ Theoretically would use artificial intelligence to create software
24. _____ Example of an authoring environment

【續下頁】



三、選擇題：(單選題，每題 2 分)

1. 下列何者與週邊設備連絡的方式不透過 CPU 而在週邊設備和主記憶體間直接傳送：

(A). Polling (B). Buffer (C). DMA (D). Interrupt
2. 下列述敘何者為非？

(A). 碟片可以用磁軌和磁區來編號 (B). 一般磁碟片的儲存媒體是圓形的
(C). 碟片表面有許多磁軌，每軌再分為磁區 (D). 磁軌是實際的儲存單位
3. 就容錯(Fault Tolerance)能力而言，以下那一種方法容錯能力最差？

(A). RAID level 0 (B). RAID level 1 (C). RAID level 5 (D). 都一樣
4. 請依處理器搜尋資料或程式指令的先後次序排列：RAM、第二層快取(L2)、第一層快取(L1)、虛擬記憶體？

(A). RAM、L2、L1、虛擬記憶體 (B). L1、L2、虛擬記憶體、RAM
(C). L2、L1、RAM、虛擬記憶體 (D). L1、L2、RAM、虛擬記憶體
5. 下列何者是一種處理不精確資料與不確定性的方法，比較像人類的推理，它處理機率與可信度，電梯操控為其一之應用？

(A). 專家系統 (B). Fuzzy Logic (C). 神經網路 (D). 基因演算法
6. 在 CPU 排程中以行程 CPU 週期的長短為依據，當 CPU 有空時即選擇下一個 CPU 週期最短的行程的方法為：

(A). 最短剩餘時間法 (SRTF) (B). 優先權法 (Priority)
(C). 最短工作法 (SJF) (D). 先來先服務法 (FCFS)
7. 請問下列何種記憶體管理在執行時僅載入部份有需要的分頁，而不是一次載入所有分頁？

(A). 分頁記憶體管理 (B). 分段記憶體管理
(C). 段頁式記憶體管理 (D). 需求分頁記憶體管理



8. 在磁碟排程法中，先從磁頭位置往外側依序執行存取請求，一直到最外側時，則回到最內側並往外側方向依序執行尚未服務之存取需求的方法為：
- (A). 循環掃描法 (B). 觀察法 (C). 最短尋徑法 (D). 掃描法
9. 下列何種檔案組織是對資料區塊提供鍵值，可透過預定程序轉換成目標位址，再依此位址直接讀出所要的資料？
- (A). 循序存取組織 (B). 直接存取組織 (C). 索引存取組織 (D). 以上皆非
10. 請問下列何者是用來進行 IP 位址與實體位址對應的通訊協定？
- (A). ICMP (B). ARP (C). IP (D). SMTP
11. 請問 IPv6 使用幾個位元來定址？
- (A). 32 (B). 64 (C). 128 (D). 256
12. 下列何者不是無線上網之特殊優點？
- (A). 變動成本低 (B). 傳輸速率較快 (C). 建置時程短 (D). 高移動性
13. 下列何項技術支援第三代多媒體服務，例如語音傳輸或視訊會議的行動通訊科技？
- (A). PHS (B). HSCSD (C). WCDMA (D). GPRS
14. 下列何者為公開鑰匙加密法的缺點？
- (A). 加密和解密的績效低 (B). 容易被破壞
(C). 鑰匙的全安分發 (D). 不能保持資訊秘密
15. 不可否認(Non- repudiation)含有以下那個意思：
- (A). 這個資訊是完整性的 (B). 這個資訊是真實和可靠的
(C). 發送者不能否認曾發送了這個資訊 (D). 以上皆是
16. 下列何者不是 UML 共有的觀點(view)？
- (A). Use case view (B). Logical view (C). Physical view (D). Process view
17. 如學校的課程安排表，一個老師可以講授多門課程，一門課程可以由多個老師講授，一個學生可以選修多門課程。這種資料儲存結構為下列何種資料庫的例子？
- (A). 階層式資料庫 (B). 網路式資料庫 (C). 關連式資料庫 (D). 以上皆非



18. 下列何者主要作為消費性電子產品與嵌入式設備應用開發的平台，如手機、PDA 或是機上盒 (Set-Top Box) 等？
- (A). J2SE (B). J2EE (C). J2ME (D). 以上皆非
19. 下列何者為一種先進的無線辨識技術，透過商品上的微晶片「標籤」，可將資訊連至電腦網路裡，用以辨別、追蹤與確認商品的狀態。
- (A). Smart Card (B). RFID (C). Bar Code (D). Biometrics
20. 下列何指令可查詢遠端主機的名稱與 IP 位址？
- (A). ping (B). traceroute (C). netstat (D). nslookup
21. 現有未排序資料 31、15、22、50、56、102、92、80、78、47、66，請利用二元搜尋法，尋找資料 22，請問共需要執行多少次才可完成任務？
- (A). 2 次 (B). 3 次 (C). 4 次 (D). 5 次
22. A neural network _____.
- (A). reaches a conclusion by applying rules and asking questions (B). is capable of learning how to differentiate patterns
- (C). is based on the concept of evolution (D). is none of the above
23. A user-agent is _____.
- (A). monitors networks (B). a person who uses a computer for you
- (C). another name for a buyer agent or a shopping bot (D). helps you perform tasks like prioritizing your e-mail
24. A data mart _____.
- (A). is a miniature data warehouse (B). cannot be used for data mining
- (C). is where you can buy consumer information for marketing analysis (D). is an umbrella term for different types of data warehouses
25. Junk e-mail is also called _____.
- (A). cookie crumbs (B). spoof (C). spam (D). sniffer script

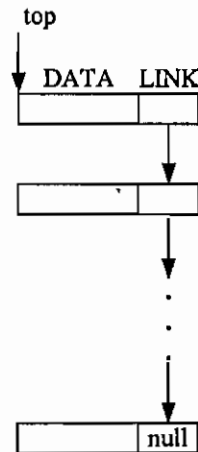
【試題結束】



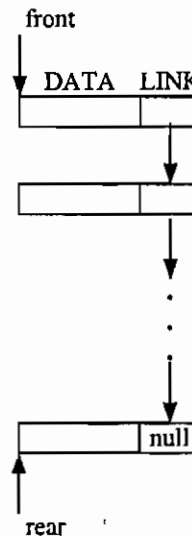
- 一、試寫出以 Heap Sort 方法排序下列資料之過程。(10 分)
資料: 12, 2, 16, 30, 8, 28, 4, 10, 20, 6, 18

- 二、假設將以 Linked Lists 方式來儲存 Stacks 及 Queues，其儲存方式如下圖(a)及(b)所示；試各寫出 Linked Stacks 及 Linked Queues 新增與刪除一項元素的演算法。(20 分)

(a) Linked Stacks



(b) Linked Queues



- 三、The following algorithm was obtained by Stephen Bernard to find an Eulerian circuit in an undirected graph in case there was such a circuit.

Procedure EULER(v)

Path $\leftarrow \{\Phi\}$

For all vertices w adjacent to v **and** edge(v,w) not yet used **do**

Mark edge(v,w) as used

Path $\leftarrow \{(v,w)\} \cup \text{EULER}(w) \cup \text{Path}$

End

Return (Path)

End EULER

- (a) An undirected graph G has n vertices and e edges. Show that if G is represented by its adjacency multilists and path by a linked list, then algorithm EULER works in time $O(n+e)$. (7 分)
- (b) Prove by induction on the number of edges in G that the above algorithm does obtain an Euler circuit for all graphs G having such a circuit. The initial call to Euler can be made with any vertex v . (7 分)
- (c) At termination, what has to be done to determine whether or not G has an Euler circuit? (6 分)



四、若陣列元素 $A(5, 3)$ 在記憶體中的位址是 5314，而元素 $A(8, 5)$ 的位址是 5422；現已知每個元素佔用 4 個位元組，則元素 $A(2, 7)$ 的位址為何？ (10 分)。

五、試寫一個能夠從 x 累加到 y 的遞迴函數 $xTOy(x, y)$ ，其傳回值即是累加的結果。例如：

$xTOy(2, 4)$ 傳回 9
 $xTOy(4, 2)$ 傳回 9
 $xTOy(4, 4)$ 傳回 4
 $xTOy(-2, 3)$ 傳回 3

(15 分)。

六、一個函數 $Y(a, b)$ 的遞迴定義如下：

$$\begin{cases} Y(a, b) = 0, & \text{若 } a < b \\ Y(a, b) = Y(a - b, b) + 1, & \text{若 } a \geq b \end{cases}$$

試求 $Y(56, 5)$ 的函數值。

(10 分)。

七、網際網路上的資訊非常豐富而且隨手可得，學生們在撰寫報告的時候，也常從網際網路取材。但若是過度參考與擷取，則可能有抄襲之嫌。試發展一套演算法與資料結構幫助老師在收到學生繳交的電子版報告時，可以挑出可疑的文抄公，並請說明您的想法及其優缺點。 (15 分)。



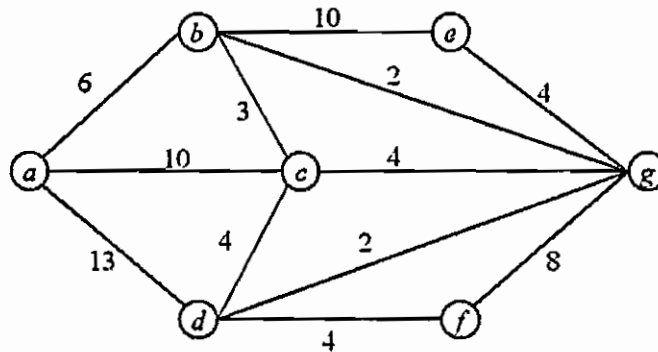
題目共 10 題，每題各 10 分

1. 若 $F_n = F_{n-1} + F_{n-2}$ 且 $F_0 = F_1 = 1$. 又設 $r_n = \frac{F_n}{F_{n-1}}$. 試問 $\lim_{n \rightarrow \infty} r_n = ?$
2. 何謂 K_5 ? K_5 是否為一平面圖 (planar graph)?
又其著色數 (chromatic number) 為何?
3. 何謂混合排序 (merge sort)? 試討論其複雜度 (complexity)!
4. 在一“二元對稱頻道”，假設其中由該頻道發射出 0 與 1 的機率相同，而 $0 \rightarrow 0$ 及 $1 \rightarrow 1$ 接收機率為 $1-p$; $0 \rightarrow 1$ 及 $1 \rightarrow 0$ 接收機率為 p . 若訊息“000”被發射出而接收到“010”. 試問其相互資訊 (mutual information) 為何?
5. 若 (P, \leq) 為一偏序集 (partially ordered set), $\|P\| = mn + 1$.
試證明 P 中必有一逆鍊 (anti-chain) 至少含 $m+1$ 元素，
或有一鍊 (chain) 之長至少為 $n+1$.



6. (10%) Let $\begin{cases} T_n - 7T_{n-1} + 10T_{n-2} = 4n - 5 \\ T_0 = 2, \quad T_1 = 4 \end{cases}$, then $T_n = ?$

7. (10%) Please use the Dijkstra's algorithm to obtain the shortest distances and paths from point a to other points.

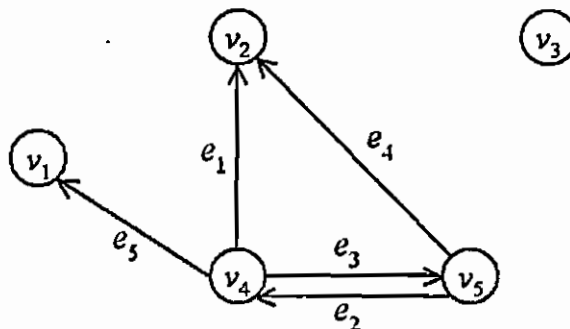


8. (10%) Give a relation R on a set S , judge the following relations are reflexive? antisymmetric? transitive? (T/F)

- [1] S is the set of positive integers and $\forall X, Y \in S, (X, Y) \in R \Leftrightarrow |X - Y| \leq 1$.
 [2] S is the set of all subsets of $\{1, 2, 3, 4\}$, and $\forall A, B \in S (A, B) \in R \Leftrightarrow A \subseteq B$, and $A \neq B$.

9. (10%) Please use the following methods to represent the directed graph G .

- [1] Let $G = (V, E)$, $V = ?$ $E = ?$
 [2] Adjacency Matrix
 [3] Incidence Matrix
 [4] Edge Matrix



10. (10%)

- [1] Find a minimal sum of products expressions equivalent to the expression $pq + pr + q'r$.
 [2] Prove or disprove the statement: $(X \rightarrow Y) \wedge (X \rightarrow (Y \rightarrow Z)) \rightarrow (X \rightarrow Z)$