國立中山大學八十八學年度碩博士班招生考試試題

科　目：經濟學　資訊管理學系碩士班 甲組　

壹. (60%)

選擇題: 多選, 每個題目有一個或兩個答案. 每題 3 分.

1. Which of the following is **not** one of the four principles of individual decisionmaking?

a. Rational people make decisions based on marginal cost.
b. People respond to incentives.
c. People face tradeoffs.
d. The cost of something is what you give up to get it.
e. None of the above.

2. Which of the following would **not** be a determinant of quantity demanded?

a. the price of the good.
b. the price of related goods.
c. income.
d. tastes.
e. the prices of the inputs used to produce the good.

3. Trade can benefit society as a whole because it allows

a. for a more efficient use of resources.
b. for goods to be obtained at a lower opportunity cost.
c. people to specialize in activities in which absolute advantage (絕對利益) exists.
d. all of the above are correct
e. none of the above

4. A market demand is

a. a vertical summation of individual demand curves.
b. a horizontal summation of individual demand curves.
c. not responsive to change in tastes and preferences.
d. determined solely by the number of buyers in the market.
e. the demand price schedule from the highest to the lowerest for all buyers.

5. Suppose you make jewelry(珠寶).If the price of silver(銀價)falls, you would

a. be willing and able to produce more jewelry than before at each price.
b. be willing and able to produce less jewelry than before at each price.
c. expect a greater demand for your jewelry.
d. expect a weaker demand for your jewelry.
e. expect the price of jewelry to fall.

6. The unique point at which the supply and demand curves intersect is called

a. market unity (統一).
b. equilibrium (均衡).
c. cohesion (凝聚).
d. an agreement(協議).
e. disequilibrium (失衡).

7. National park is now charging higher entrance fees than before. This should result in

a. a movement up a downward-sloping demand curve for park visits.
b. a decrease in the demand for park visits.
c. a movement down an upward-sloping supply curve for park visits.
d. All of the above answers is correct.
e. None of the above.

8. Suppose that this summer is expected to be unusually hot.
Which one would occur in the ice cream market as a direct result of this event?

a. The supply would increase.
b. The demand would increase.
c. The equilibrium price would increase definitely.
d. There would be a decrease in the equilibrium quantity.
e. None of the above would occur.

9. Economies are large groups of people engaged in interdependent activities. In a free market system, what prevents decentralized decision-making from degenerating into chaos (避免各自決策而陷入混亂)?

a. the benevolence (仁慈) of the sellers
b. the morality (道德) of the buyers
c. prices mechnism
d. the government control
e. quantities unsold

10. For a linear demand curve, we would expect lower prices to correspond with

a. a more price-sensitive demand.
b. a less price-sensitive demand.
c. greater total revenue.
d. lower total revenue.
e. none of the above.

11. Economists understand that people's decision making respond to

a. the wishes of policymakers.
b. the pleasure of leaders.
c. the pressure of lawmakers.
d. changes in costs and benefits of private actions.
e. some mysterious power.

12. Causes of market failure (缺失) include:

a. incorrect forecasts of consumer demand and foreign competition.
b. externalities and foreign competition.
c. market power and incorrect forecasts of consumer demand.
d. externalities and market power.
e. foreign competition and market power.

13. Market power refers to

a. the ability of a person (or group of people) to market new products.
b. the relative importance of a market to the overall economy.
c. the power of the government to regulate (管制) a market.
d. the power of a single person (or small group of people) to unduly influence (不當影響) market prices.
e. none of the above.

14. Which of the following government actions is most likely motivated by a concern for equity(基於公平考慮)?

a. enforcing antitrust laws
b. providing job training programs
c. enforcing environmental regulations
d negotiating free trade agreements
e. imposing minimun wage laws

15. Which of the following government actions is most likely motivated by a concern for efficiency(效率)?

a. enforcing antitrust laws
b. providing job training programs
c. taxing the sale of luxury goods
d. imposing minimum wage laws
e. negotiating the World Trade Organization Agreements

16. The income of a typical worker in a country is most closely linked to which of the following?

a. population
b. labor unions
c. government policies
d. productivity
e. welfare payments

17. Which of the following would reduce both the equilibrium price and equilibrium quantity of bananas?

a. a higher price for apples

b. a lower price for apples

c. an increase in consumer income, assuming bananas are normal

d. fewer buyers

e. none one of the above are correct.

18. In most free markets,

a. surpluses and shortages are only temporary(暫時的).

b. equilibrium is established quickly.

c. the law of supply and demand is prevalent(常態的).

d. All of the above are correct.

e. None of the above is correct.

19. Suppose that there is an increase in the price of crude oil (原油) and, at the same time, there is technological advancement(技術進步) in refined products, such as gasoline (汽油). We would expect the supply of gasoline

a. to increase.

b. to decrease.

c. must increase or decrease.

d. could increase, decrease, or remain unchanged.

e. none of the above.

20. Which of the following would be an example of an oligopolistic (寡占) market?

a. a domestic rice market

b. air travel

c. the software industry

d. electrical power for residential consumers (居民).

e. none of the above

貳、簡答題 (40%)，每題10分

1. 何謂勞動生產力？其衡量單位是什麼？提升勞動生產力有那兩種方式？
2. 何謂經濟循環(business cycles)？如何區別經濟擴張時期與經濟衰退時期？請以國內近3至4年(1996～1999)為例說明之。
3. 中央銀行有那三項主要的貨幣政策工具？我國的中央銀行還有那些次要的貨幣政策工具？
4. 股市活絡吸引外資流入時，對國內的匯率、對外貿易及經濟活動有何影響？試以國內目前情勢說明之。

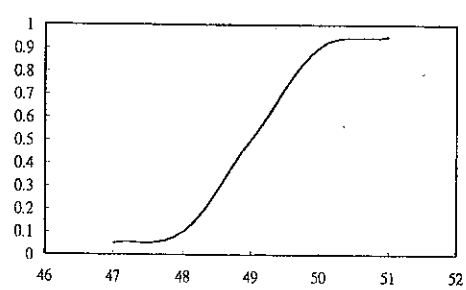
共有七大題，每一大題各有若干小題，每一小題五分
（計算所需之統計數據附於試題最後）

1. Multiple choice (複選; choose the correct statement(s) for each question)

(a) A sample of two elements is to be drawn without replacement from the population which contains five distinct elements, {A, E, I, O, U}. The population is partitioned into two groups, one with {A, I, O}, and the other with {E, U}. The drawing mechanism is to randomly select one group first, and then select one element randomly from this group.
① The sampling mechanism follows the simple random sample
② Probability that {A, O} will be selected is one-sixth
③ Probability that {I, E} will be selected is one-twelfth
④ Probability that A will appear in the selected sample is one-third
⑤ Probability that U will appear in the selected sample is one-fourth

(b) To compare two sets of data, one may use the quantile-quantile plot, i.e., the quantiles of the first sample are plotted (as the x-coordinate of the pair) against the corresponding quantiles of the second sample (as the y-coordinate of the pair). If both samples were exactly the same, the plot would be a straight line with slope 1 and intercept 0.
① A slope greater than 1 indicates larger variability in the first sample.
② A negative intercept with y-axis indicates larger mean in the first sample.
③ If the sample sizes are different, order statistics of the smaller sample is used to determine the quantiles used.
④ This method can also be used to determine the data distribution without estimating the parameters of the theoretical distribution.
⑤ This method can also be used to determine the data distribution without specifying the theoretical distribution.

(c) A power curve of a hypothesis test about population mean μ with known population standard deviation σ is given as follows.



The standard mean level μ_0 is 47 and the sample size n is 100.
① The null hypothesis is $\mu \geq 47$.
② When μ=47, the α risk is 0.05 and the β risk is 0.95.
③ The critical region is where the sample mean $\geq$ 49.
④ The new curve of increasing n will not intersect with the original curve.
⑤ σ = 10.2

2. A research is conducted to determine whether it is cost-efficient to implement a drug-testing program for intercollegiate athletes. Possible outcomes and associated estimated costs are identified as follows ("+" means positive test result; "–" means negative test result).

Test	+	Drug users	User identified:	0
		Not drug users	False accusation:	c_1
	–	Drug users	Unidentified user:	c_2
		Not drug users		c_3
Do not test	Drug users		Unidentified user:	c_2
	Not drug users			0

Test sensitivity refers to the probability that the test is positive if the testee is a drug user while test specificity, the probability that the test is negative if the testee is not a drug user.

(a) Suppose that the fraction of drug users in the population is 5% and the test specificity is 95%. Furthermore, we assume that the test specificity is equal to the test sensitivity. What is the probability that a testee whose test result is positive is actually a drug user?
(b) The equality assumption in (a) is usually not true. It is observed that false positive rate can be small while false negative rate can be large. What impact will this observation have on your answer in (a)?
(c) To justify drug-testing implementation, it is required to have smaller testing cost than not-testing cost. Show that the necessary condition for the above statement is that the probability of a testee with a positive test result being a drug user is greater than the ratio of $c_1/[c_1+c_2]$.
(d) If c_1 is equal to c_2, will you recommend implementing the drug-testing program based on the conditions in (a) and (b)?

3. The J&B Card Shop sells calendars with pictures of endangered species shown for each month. The once-a-year order for each year's calendar arrives in September. From past experience, the September-to-July demand for the calendars is a uniform distribution ranged from 350 to 650 units. The calendars cost $2 each and J&B sells them for $3 each. J&B throws out all unsold calendars at the end of July.

(a) What is cost per unit of overestimating demand? How about the cost per unit of underestimating demand?
(b) Intuitively, do you think J&B manager should order more than or less than 500 units? If order quantity is q, what is the probability that J&B incurs an opportunity cost of insufficient ordering? What is the probability that J&B suffers from excessive ordering?
(c) To determine the order quantity, J&B manager equates expected loss of ordering one additional unit to the expected loss of not ordering one additional unit. Based on this statement, find the desired order quantity.

4. A manufacturer of automobile batteries wishes to determine whether there are any differences in three media (Magazine, TV, radio) in terms of consumer recall of an ad. The results of an advertising study are as follows:

	Media			
Recall Ability	Magazine	TV	Radio	Totals
Number of persons remembering ad	30	16	14	60
Number of persons not remembering ad	70	84	86	240
Totals	100	100	100	300

At the .05 level of significance, is there evidence of a media effect with respect to the proportion of individuals who can recall the ad.

5. A statistician for a famous automobile manufacturer would like to develop a statistical model for predicting delivery time (the days between the ordering of the car and the actual delivery of the car) of custom-ordered new automobiles. The statistician believes there is a linear relationship between the number of options (X) ordered on the car and delivery time (Y, in days). A random sample of 10 cars is selected with the results given as the following table:

Car	1	2	3	4	5	6	7	8	9	10
X	3	5	7	7	9	12	16	19	23	25
Y	25	32	35	38	39	51	58	62	66	70

$\bar{x}$	$\sum x_i^2$	s_x^2	$\bar{y}$	$\sum y_i^2$	s_y^2	$\sum x_i y_i$
12.6	2128	60.044	47.6	24904	249.6	7083

(a) Use the least square method to find the regression coefficients of the intercept (b_0) and the slope (b_1). (5)

(b) Compute the coefficient of determination r^2 and interpret its meaning in this problem.

(c) At the .05 level of significance, is there evidence of a linear relationship between number of options and delivery time?

(d) Draw a plot of residuals over number of options and determine the adequacy of the fit of the model.

6. A professor in the MIS department wishes to study computer usage of two project teams in a class, team A and team B. A random sample of 4 jobs from team A and 5 jobs from team B in the last week is selected, and the processing time (in seconds) for each job is recorded with the following results:

Team	Processing Time (in Seconds)				
A	9	12	5	6	
B	13	4	9	9	7

At a significance level of 0.05,

(a) Is there evidence of a difference in the mean processing time between the two teams?

(b) What assumptions do you need for solving part (a)?

(c) Is there evidence of a difference in the variances in the processing time between the two teams?

7. 令 p 表示對生活品質感到滿意的高雄市居民之比例。根據上個月的調查結果，滿意的比例值是 0.4。在顯著水準 0.05 的情況下，若是本月將進行一次抽樣調查，

(a) 應該取得多少樣本使誤差少於 0.03？

(b) 研究調查人員假設 $H_0: p = 0.5$，$H_1: p > 0.5$，若是高雄市居民對生活品質感到滿意的實際比例是 0.65，當樣本數為 300 時，型二錯誤的風險值應是多少？

	$\chi_\alpha^2(1)$	$\chi_\alpha^2(2)$	$\chi_\alpha^2(3)$	$\chi_\alpha^2(6)$	$F_\alpha(3,4)$	$F_\alpha(4,3)$	$t_\alpha(4)$	$t_\alpha(5)$	$t_\alpha(7)$	$t_\alpha(8)$	$t_\alpha(10)$	z_α
α=0.05	3.842	5.992	7.815	12.592	6.591	9.117	2.132	2.015	1.895	1.860	1.813	1.645
α=0.025	5.024	7.378	9.348	14.449	9.979	15.101	2.777	2.571	2.365	2.306	2.228	1.960
α=0.01	11.345	15.086	18.475	26.217	16.694	28.710	3.747	3.365	2.998	2.897	2.764	2.326

Note: $\alpha = \text{Prob}(X > x_\alpha)$

國立中山大學八十八學年度碩博士班招生考試試題

科　目：管理資訊系統 / 資訊管理學系碩士班(乙組)　　

1. 請說明下列名詞(每小題各 5 分)
   a. 何謂資訊系統規劃（說明其應考量之因素或內容等）?
   b. 何謂 Y2K 問題?（至少舉兩種情況）
   c. 何謂 Critical Success Factors Method?（說明其執行步驟）
   d. 何謂 Information System Infrastructure?
   e. 何謂 WWW? 有那些應用實例（至少舉兩個）?

2 某公司目前之銷售、採購與生產管理等作業均以人工作業處理，但各作業及表單均已制度化與合理化。該公司已決定將這些作業電腦化，並將系統之建置外包給某資訊公司，若你是這資訊公司之分析師，請問你應如何分析與完成該系統之 Entity-relationship Diagram。你必須具體的說明如何找出 Attributes, Entity types 與 Relationship，並詳述你所用之步驟、規則與方法等才有可能得分。(25 分)

閱讀本頁及下頁四則有關大學研究所排名新聞之後，回答下列問題。

3.身為一面臨升學選擇的大學生，我需要什麼樣的資訊？請簡要的列出這些資訊，並加以定義。25%

4.要提供此類的資訊，社會上的機構如政府（教育部、經濟部等）、學校、雜誌、補習班或其他等，必須扮演的角色為何？請以一簡圖描述，並簡單的說明。25%

天下雜誌 問卷調查

台大九類研究所 學術聲望第一

高等學府龍頭仍屬台大

清大緊追在後　醫學院部分　高醫公衛系排名第二

【記者張志清台北報導】天下雜誌昨天公布國內「最佳研究所調查」，受訪十八類研究所中，台大奪下九大類「學術聲望」第一，穩坐國內高等教育龍頭寶座；清大緊追在後，拿下四類學術聲望第一。在所有研究所聲望混合排名中，台大經濟所高居全國第一。最難考的研究所則為企管、會計和教育所，平均錄取率都在十％以下，有的學校甚至只有二％。

天下表示，這次是根據教育部資料，鎖定研究生在學人數超過二千人、國內相同系所數量超過十所的研究所作為選評對象。共選擇法律、經濟、中文、外文、教育、數學、物理、化學、機械、電機、土木、化工、資工、企管、會計、統計及資管等十八類，共計二百七十六個研究所進行問卷調查。

各研究所學術聲望調查係由各大學學院院長、系所主任及學校自行推薦的三位資深教授進行「學術聲望」互評，每人都可以給其他學校相關系所一至五分，但不評自己的系所，最後再計算平均分數。

列入評選的全國各大學校院十八類研究所中，台大中文、外文、經濟、會計、法律、化學、電機、機械、土木等九個研究所都拿下學術聲望第一。強調發展為研究型大學的清華大學則在基礎科學領域表現優異，數學所、物理所、化工所及統計所稱冠全國。台灣師大的教育所、政大企研所、台北師院國教所、交大資工所、中央資管所也在各自領域奪魁。

企管和電機等熱門研究所的校際競爭中，以「企家班」聞名的政大企研所雖然聲望排名穩居王座，但台大商研所緊追在後，中山大學企研所也亦步亦趨。電機所方面，出了林百里、曹興誠等多位科技新貴的台大被公推第一，鄰近新竹科學園區的清大和交大則分居二、三名。

在醫學院方面，台大醫學系、護理系、公衛系學術聲望均排名第一，陽明醫學系、護理系第二；高雄醫學院公衛系排名第二。

【記者張志清台北報導】學術聲望調查第一就是最佳研究所？天下雜誌昨天公布最佳研究所調查，引發部分人士質疑主辦單位，以主觀性極高的「學術聲望」作為學校系所排名，評分者多半憑刻板印象給分，對立足點原本就已經不太平等的私立大學以及新設國立大學並不公平。

中山大學推廣教育中心主任廖達琪昨日主動前往記者會場發言指出，私立學校和新設立國立大學與台大等「資深」大學原本就已經立足點不平等，卻未見調查單位對這個現象改善問卷調查設計。評比結果只是讓一些老校的「資本」愈滾愈大，讓新設國立大學及私立學校毫無翻身的機會，甚至可以說是一個打擊。

天下雜誌人員則解釋說，調查設計已經考量這個問題，為避免公私立學校資源不同或成立時間長短，造成立足點不公，調查報告中也提供各研究所歷史背景、專長領域，以及發展特色等資料，希望能夠彌補學術聲望評比的不足。有心就讀研究所的人可依據自己的興趣、環境，選擇最適合的研究所。

不過，這個說明反而引發記者會現場更多人疑問。有人質疑，既然天下知道學術聲望評比是非常主觀的認定，為什麼還是以此來排名，而且將全國相關研究所從第一名排到最後一名？為什麼不採納較客觀的師生比、研究所錄取率、報到率、專任教師開課數等做比較？

中山大學：立足點不平等

延周更應計設卷問認 觀主之失比評「望聲」疑質校學分部

天下舉辦的最佳研究所調查，共發給全國二百七十六個研究所，由研究所互相評比。回收二百六十五份，但東海化學、物理、數學所，台灣師大物理所，中興外交、應數所，成大資管所、淡江機械所、實踐企研所以及中央警官大學的法律所都拒絕作答。

【記者張志清、陳榮裕台北報導】「錯誤的假設是大浩劫的開始！」、「根本沒有到學校實地訪視，如何做評鑑？」，這兩年，國內民間團體興起一波大學評鑑熱，但是部分學校主管人員昨天相當感慨的表示，校際評鑑當然有必要，但是學校評鑑是大事，主辦單位必須要有周延的考量與設計，否則將是一場「浩劫」的開端。

台大校長陳維昭私下談到這兩年各單位辦理的大學評鑑時表示，去年某單位主辦大學學術聲望評鑑，要求各校評比其他學校的課程及師資，卻根本沒有提供相關書面資料，也沒有要求他們到各校進行訪視，如此評鑑，如何談得上品質？

輔大校長楊敦和認為，評鑑結果應該有分數，但最好不要總體排名，以免強化不合宜的排行印象。

楊敦和並認為最好先不做「聲望」評比，因為涉及主觀大，變動性也較大。另外特色不同的大學最好不要合併評鑑，政大以人文社會科學為主，清大以理工科學為主，很難用同一標準比較高下。新、舊大學，公、私立大學也不宜放在一起比較。

評鑑大學系所 名不正則言振？

——對「一九九九年天下雜誌優秀研究所調查」之我見

⊙沈文仁

天下雜誌日前公布其「一九九九年天下雜誌優秀研究所調查」結果，包括中時、聯合等各大報以極大篇幅刊出，引發學術界、教育界的熱烈討論。筆者認為透過這類的調查研究，藉以反映國內研究所的現況，立意甚佳。執行此調查的天下雜誌以其本身累來的優良形象及社會公信力，調查結果具有相當程度的指標性。正因為天下雜誌具有相當的社會公信力，若因為調查對象受侷限，而使調查結果未盡客觀，不單是抹殺了未被納入調查對象的研究所長久以來的努力，更將造成社會大眾的誤解，這樣的影響實不可小覷。在這裡筆者以個人觀察提供以後做類似調查之機構參考，也希望社會大眾能從另一個角度看這樣的調查報告。

筆者任職電機資訊學院院長，對於此類的調查能對學校產生正面激勵效果而樂見其成，也鼓勵本院各系所參與這類的調查。今年二月收到天下雜誌的問卷後，曾因其問卷電機工程學研究所類並未包括交大之電子、電信及光電等本應屬於電機工程領域的研究所，而去電天下雜誌詢問，並向調查負責人說明所謂「電機」二字包括的內涵，電子、電信、控制、光電等都是屬於電機的範疇，若真要客觀調查電機工程學研究所，實應該把這些研究所都包括在內。然而筆者得到的答覆卻是研究所名未冠有「電機」二字即不列入調查對象，這實在是有待商榷的作法。

若細看「電機工程類」排名第一的台大電機研究所，其專長為「電子、電信、電腦、光電、醫電等領域師資齊全」，而排名第二的清大電機專長為「微電子、微電機、光電、系統、通訊、電子等」，不也都說明了電子、電信、通訊、光電等均屬電機工程的範疇？何以電子、電信、光電等研究所卻無法列入評比？說來有趣也無奈的一點，若非本校「控制工程學系」去年更名為「電機與控制工程學系」，恐怕也無緣榜登「電機工程學類學術聲望第三名」？

本院在電機資訊高科技領域裡長期投入，不論是研究、教學、師資以及畢業生表現皆有目共睹，但這二年來卻一再因名稱不符而被排除在外，在調查結果公開之際總是成為被遺忘的一群，不免對長期投入的校方、院方及師生們帶來莫大的挫折及委屈，真的是「名不正而言不順」？類似的情形也發生在本院的「資訊科學所」，因不符調查所要求的「資訊工程」類別而未被納入調查對象。然而，我們若仔細看看天下雜誌在企管類的評比，台大商研所高居第二，但商研所之所名卻不見有「企管」二字，如此雙重標準，實在令人感到疑惑。

筆者以為這類的調查評比，能造成同領域研究所之相互觀摩而帶來良性競爭，但若因涵蓋的研究所數目不夠周延則失去其意義。在美國，權威性的大學評鑑亦是將電機（Electrical）、電子（Electronic）及通訊／電信（Communications）歸為一類，而且評鑑中也多以學校為評比單位，而非以單一科系或研究所。最近U.S. News的Best Graduate School評鑑即為一例（可參看www.usnews.com）。

評鑑系所的歸類應以實質的內涵為原則，避免侷限於系所名稱之歸類，例如電機工程學類應涵括電機、電子、通訊、光電等同領域之系所；而資訊工程學類應改為資訊類，讓國內的資訊科學系所亦能一同列入評比。以清大資訊工程系為例，去年未改名前為「資訊科學系」，未被「天下」雜誌納入評比，今年改為「資訊工程系」則在學術聲望名列第三。系所的本質未變，卻因「名稱」而造成不同的社會印象，實在令人懷疑這樣的調查有多少的「客觀」與「公信」。

我們不敢要求這類的調查評比做到百分之百的客觀公正，但至少給一些性質相同但名稱「類似」的系所一個機會，以免有遺珠之憾。

（作者為交通大學電機資訊學院院長）

量考的所究研比評

回應沈文仁院長對研究所調查的疑質

憲宗莊⊙

貴報在四月二十一日刊出交大電機學院沈文仁院長投書，針對名稱不相符即不納入的評鑑法提出質疑。天下雜誌與沈院長進一步溝通後，認為有必要將真相說明清楚，以昭公信。

首先要解釋沈院長及其他學界人士的疑問，為什麼天下雜誌只選擇十八類研究所進行評比，其他諸如新聞傳播所、電子所、通信所未列評比？這並非天下雜誌選擇特定研究所進行評比，而是依據教育部分類資料，選定該類研究所碩士班在學人數超過兩千人、相同系所超過十所，符合標準者共十八類研究所進行評比。而新聞傳播所、電子所、通信所等，因在學人數不足或未超過十所，而且領域差異甚大，不易合併比較。

沈院長另一個疑問，為國外媒體類似評比單位為學校或學院，為何天下雜誌要以研究所為評比單位，以致產生「名不正即遭三振」的問題。其實去年天下雜誌第一次進行研究所調查時，便是以學院為單位，針對商學院、工學院、法學院、醫學院等學院，發問卷給各校進行評比，結果與其他以大學作為評比單位的媒體，招致相同批評：分類不清、各校差異過大。如台大、清大、交大都已成立電機學院，許多學校電機所仍歸屬工學院；再如經濟所，有些學校歸類為法學院，有些歸類為商學院。

為徹底解決歸類問題，天下雜誌今年決定將評比單位落實到研究所，以求更細緻的評比成果，根據教育部大學一覽表及各校提供資料，只要名稱、內容相符合，全部納入評比。像經濟所中，產業經濟所也納入評比，再如數學、化學所，應用數學及應用化學所也都列入排名。至於沈院長所提台大商研所未有企管之名，為何也列入企管所排名？因為除了名稱，教學內容更是重點。眾人皆知政大企研所與台大商研所向來互視為競爭對手，共評殆無疑義，更罔論各校企研所名稱各不相同。

為求公平，這次調查原則為各類型研究所，每所大學只能有一所參與排名。在作業前，我們也儘可能詢問各校在該類研究所，由那一所參加評比。不過如台大、清大、交大等國立大學已發展多年，在學術研究、實務結合上均有卓越成就，在高等學術領域發展也更為精細，許多優秀研究所因分類問題造成在學人數、相同系所不足，成為無法評比的遺珠之憾。為求完備，我們也接受沈院長建議，在往後的研究所評比中，天下雜誌願意投入更多人力與時間，對更多類型研究所進行評比。

（作者為天下雜誌「最佳研究所調查」召集人）

國立中山大學八十八學年度碩博士班招生考試試題

科　目：計算機概論（資訊管理學系碩士班）　　共 3 頁 第 1 頁

一、選擇題 (60%)

1. Consider the recurrence $T(n) = 3T(\lfloor n/4 \rfloor) + n$. What would be its upper bound (a) O(n), (b) $O(n^2)$, (c) O (*log*n), (d) not of the above.
2. Take Pentium CPU as an example. It uses 32 bits (from left to right is b_{31} to b_0) to represent a single precision floating point real number. Bit b_{31} is a sign bit, and b_{30} to b_{23} represents the exponential digit. What would be the range it can represent. (a) 0 ~ 255, (b) –127 ~ 128, (c) –128 ~ 127, (d) not of the above.
3. A CPU performs a cycle of four steps for each instruction: fetch, decode, execute, and store. Which component will execute the instructions: (a) register, (b) CU, (c) ALU, (d) not of the above.
4. Continued on the previous question: machine cycle consists of two segments of time: I-time and E-time. Please denote which answer composes I-time. (a) fetch, (b) fetch and decode, (c) execute, (d) execute and store.
5. In the normalization of database design, each nonkey attribute should be dependent only on the relation's key, not on any other nonkey is the property of (a)1NF, (b) 2NF, (c) 3NF, (d) 4NF.
6. Which of the following activities facilitate database recovery? (a) backup, (b) transaction log, (c) forward recovery, (d) all of the above.
7. In CSMA/CD protocol, if one host sending a message collides with others, the host will wait a random number of slot-time before trying to re-send the message. The random waiting slot time is calculated by binary exponential backoff algorithm. If the host collides twice, what would not be the possible slot time it will wait before the third trial. (a) 2, (b) 4, (c) 6, (d) 8.
8. To divide IP Class B addresses (say 130.200.0.0) into 5 subnetworks. Which netmask should be applied? (a) 255.255.0.0, (b) 255.255.224.0, (c) 255.255.240.0, (d) 255.255.248.0.
9. Continued on the above question: At most how many valid subnetworks can be allocated? (a) 5, (b) 6, (c) 7, (d) 8.
10. Which technology can be used for firewall? (a) packet filtering, (b) gateway, (c) proxy, (d) all of the above.
11. Which protocol belongs to IP layer? (a) HTTP, (b) ARP, (c) SMTP, (d) all of the above.
12. Distributed computing environment can be achieved by (a) client/server model, (b) remote procedure call, (c) Internet, (d) all of the above.
13. Which of the following is a right statement about client/server model: (a) a client/server program follows a predefined protocol, (b) a server program receives a client request by interrupt, (c) a client/server application cannot run on a single machine, (d) none of the above.

14. Which of the following is not a line-sharing device allowing multiple devices to share communication circuits: (a) multiplexer, (b) multistation access unit (MAU), (c) concentrator, (d) front-end processor.
15. Which of the following is not an interconnection device: (a) router, (b) repeater, (c) proxy server, (d) bridge.
16. Which of the following is not a search technique used in computers (a) object-oriented, (b) neural network, (c) artificial intelligence, (d) exhaustive search.
17. Which of the following is a wrong statement for computer virus: (a) a computer might be infected even without connecting to a network, (b) an infected program should be an executable file, (c) some virus lies silent until a specific date or time arrives, (d) some virus might collect your information.
18. Which of the following is not an advantage of flow chart diagrams (a) ease of coding, (b) ease of maintenance, (c) ease of debugging, (d) ease of documentation.
19. Which of the following is a wrong statement about object-oriented programming (OOP): (a) OOP do not have the concept of structured programming, (b) an object contains data as well as operators, (c) objects can be used by different programs, (d) OOP can be used for parallel programming.
20. Which of the following is a wrong statement about assembly language: (a) an assembly program occupies less space than that written by high level language, (b) an assembly program can be more efficient than that written by high level language, (c) an assembly program can be executed without translation, (d) two identical machines running different operating systems understand the same assembly language.

二、計算及問答題（40%）

1. Please read the following function and answer the two questions (10 points):

```
int fun(int x, int k) { /* return a value of type integer */
  if x =1 then return k;
  else ans = fun(x/2, k);
return ans
}
```

(a) Suppose x=10 and k =1, ans=?

(b) Suppose x=2000 and k=3, ans =?

2. Calculate the following using 2'complement and SHOW THE RESULTS IN DECIMAL NUMBER SYSTEM. Please show the detailed steps when you get the results. Note that for (b) you need to transform the number into binary number system first, and then using 2's complement to get the result. (7 points)

(a) $10110_2 - 11011_2$

(b) $252_{10} - 53_{10}$

3. Assume that the access time between CPU and a cache is 20 *ns* and that between CPU and a RAM is 0.1 *us*. Consider the execution of a program with 1,000,000 instructions, a sequential program without loops, where each instruction is 2-byte long. Assume that the execution time primary depends on the access time of instructions. That is, if an instruction is in a cache, the execution time of the instruction is 20 *ns*. Otherwise, it is 0.1 *us*. Furthermore, we assume that each instruction resides only in one place, i.e., either cache or RAM, but not both. Let the price of a 10,000-byte cache be NT$1,000. Due to financial budget, we consider the following objective functions. (12 points)

   A. Let X be the total execution time of the program divided by 0.1 *ms*. Suppose there are w instructions are placed in cache. Please formulize X in terms of w.

   B. Let Y be the total cost spent on purchasing cache divided by NT$1,000. Based on the above assumption, what is the expression of Y in terms of w.

   C. Assume that our final objective function is $X + Y^2$ and that our goal is to minimize the objective function. What is the optimized value of w?

4. Please write logic expressions for the following questions (8 points)

   A. Given two inputs, X and Y, write a logic expression that outputs 1, if the values of this two inputs are different. Otherwise, outputs 0. You are required to use only ONE logic operator to fulfill the expression.

   B. Given three inputs, X, Y, and Z, write a logic expression that outputs 1, if one and only one of the inputs has the value of 1. Otherwise, outputs 0.

5. Assume that you are a network administrator. If NIC (Network Information Center) gives you a class B address, based on IPv4, how many IP addresses is in your control? (3 points)

1. (6 points) Please use the following predicates:
   H (x) : x is a horse
   M (x) : x is a man
   W (x) : x is white
   to obtain a First Order Logic (FOL) well formed formula (wff) of the statement: "Every white man has a black horse".

2. (7 points) Solve the recurrence relation: $f(n) = 4\, f(n/2) + 2\, n^2$, where n is a power of 2, and $f(1) = 1$.

3. (7 points) Solve the recurrence relation: $g(n) = 2\, g(n-1) - g(n-2) + 4$, where $g(0) = 0$, and $g(1) = 2$.

4. (15 points) Given three arbitrary sets A, B, and C, indicate the result of the following statements as well as explain (justify) your answers.
   A). $A \oplus A = \varnothing$
   B). If $A = B - C$ then $B = A \cup C$
   C). $(A - B) \cap B = B$
   D). $(A \cup B) - C = (A - C) \cup (B - C)$
   E). $(A \cup B) \cap (B \cup C) \cap (C \cup A) = A \cap B \cap C$

5. (15 points) Let R be a binary relation. Let D_1 and D_2 be the domains of the two components of R. Define that $D = D_1 \cup D_2$. Indicate the result of the following statements (i.e., true or false) as well as explain/justify your answers.
   A). R is reflexive if and only if $\forall\, x \in D\ (x\, R\, x)$
   B). R is irreflexive if and only if $\neg\, (\forall\, x \in D\ (x\, R\, x))$
   C). R is symmetric if and only if $\forall\, x, y \in D\ (x\, R\, x \Longrightarrow y\, R\, y)$
   D). R is transitive if and only if
   $$\forall\, x, y, z \in D\ (x\, R\, y \wedge y\, R\, z \Longrightarrow x\, R\, z)$$
   E). Any relation must be either reflexive or irreflexive.

6.(5 分) 三位正整數中, 比如說 abc, 有一些可以滿足 $a^3+b^3+c^3$ = abc 的數稱做 Armstrong 數。 請列出最大的 Armstrong 數來。

7. (5 分) 函數有定義域和值域的觀念。 請問

```
main()
 {
  int a = 300;
  while (2.3 <> 1.8} do
     printf(a);
 }
```

的定義域是什麼？

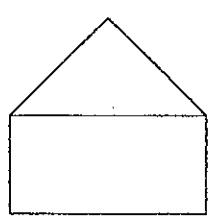
8. (5 分) 將 expression a*b + c*d/e*f 的 postfix 寫出來。

9. (5 分) 著名的 Hanoi Tower 問題裡，有三根柱子和 N 個盤子。請問若 N 值是 100 時,總共要搬幾次才會完成？

10. (5 分) Class A 有一個屬性 ANo 其型態爲 enumerated type {1,2,3}, Class B 繼承 Class A 的屬性 ANo,並自己擁有屬性 BNo 其型態爲 enumerated type {m,n}。若說 Class B 的 set 爲 {(1,m),(1,n),(2,m),(2,n),(3,m),(3,n)}共有 6 元素, Class A 的 set 爲 {(1),(2),(3)}共有 3 元素。 乍看之下, 3 個元素數目少於 6 個元素。 那爲什麼還說 A 包含 B？ 請用集合觀念說明之。

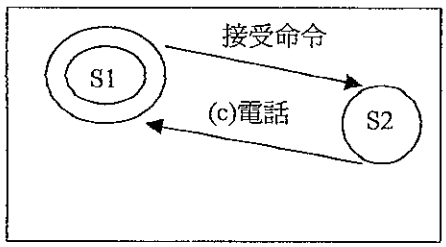
11.(5 分) 如果鈔票面額是 1,3,4 元,若有 10 元要兌換,請問兌換出來的鈔票張數最少的方式是什麼？

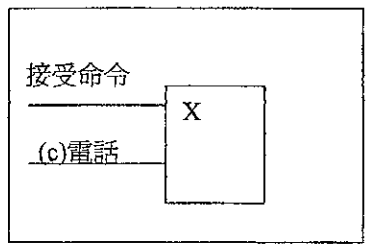
12. (5 分) 下圖可以一筆畫走完所有的邊,且不重複。請問它符合 Euler 定理的那些條件？



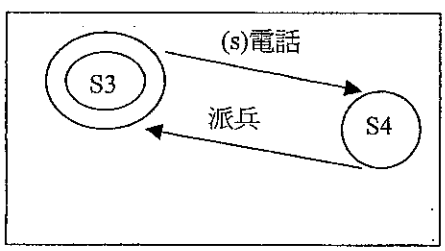
13. (5 分) 函數 add (3.2, 4.56)所計算出來的值是 7.76。請問函數 add 的型態 (Type) 是什麼？

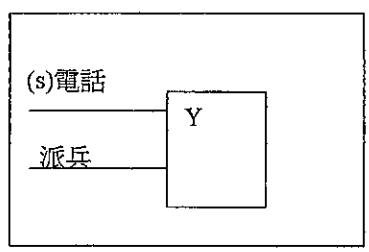
14. (10 分) 系統 X 的行爲與外觀如下。 S1 是其初始狀態。



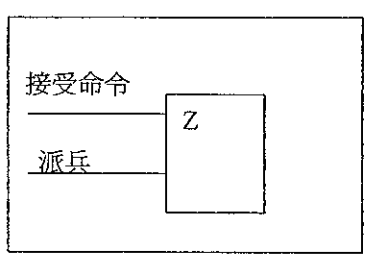


系統 Y 的行爲與外觀如下。 S3 是其初始狀態。





X 系統的 (c)電話和 Y 系統的 (s)電話互相對應後合成一對互動 (interaction)。若系統 X 和 Y 組合 (Compose) 成系統 Z 之外觀如下。



請問系統 Z 的行爲是什麼？

1. Consider the following snapshot of a system:

Resource available is: (1 5 2 0)

Process	Current Allocation	Maximum Demand
P1	0 2 1 2	3 2 1 2
P2	1 0 0 0	1 7 5 7
P3	1 3 5 4	2 3 5 6
P4	0 2 3 2	0 2 5 2
P5	0 0 1 4	2 6 5 6

(a) What is the content of the matrix Remaining Need? (5%)

(b) Using Banker's algorithm to determine if the system is in a safe or unsafe state? If it is safe, show a sequence of transactions by which all processes complete. If it is unsafe, show how it is possible for deadlock to occur. (10%)

(c) If a request from process P2 arrives for (0,4,2,0) can the request be granted immediately? If it can, draw out the new safe state, if it can't, explain why? (5%)

(d) If a request from process P2 arrives for (0,4,0,0) can the request be granted immediately? If it can, draw out the new safe state, if it can't, explain why? (5%)

2. Suppose sum := sum + 1 is implemented in a machine language as follows:

```
LOAD R, sum
INC  R
STORE R, sum
```

Initially, let the value of sum be 0. Without any coordination, it is possible that five concurrent processes that execute "sum := sum + 1" may make the value of sum become 3. Show a scenario that produces such an incorrect result. (10%)

3. In UNIX systems, what socket type should be used to implement an intercomputer file-transfer program? What type should be used for a program that periodically tests to see if another computer is up on the network? Explain your answer. (15%)

4. Consider the following C-like function: (15%)

```
max_subseq_sum(int a[], int n)
{
int this_sum, max)sum, best_i, best_j, i, j, k;
    max_sum=0; best_i=best_j=-1;
    for (i=0; i<n; i++)
    for (j=i, j<n; j++)
    {
        this_sum=0;
        for (k=i, k<=j; k++) this_sum += a[k];
        if (this_sum > max_sum)
        {
            max_sum=this_sum;
            best_i=i;
            best_j=j;
        }
    }
    return (max_sum);
}
```

a. What is the above function doing? (8%)

b. Please precisely calculate its running time. (7%)

5. Consider the following recursion function C(n, k): (25%)

C(n, 0)=1, and C(n, n)=1 for n>=0.

C(n,k)=C(n-1,k)+C(n-1, k-1) for n>k>0

a. Develop a recursive program to compute C(n, k) (10%)

b. What is the time complexity of your program? (5%)

c. Could you derive another program to more efficiently compute C(n, k) (without making use of the above formula)? If so, show it. (10%)

6. Consider a bipartite graph (V1, V2, E). A matching of a graph is a set of edges no two of which are adjacent to the same vertex. A maximum matching of a graph is a matching with maximum size. Show an example illustrating how the maximum matching problem of a bipartite graph can be converted to the maximum flow problem of a network (10%)