國立雲林科技大學
九十三學年度碩士班入學招生考試試題

系所：工管系
科目：作業研究

請依題號作答並將答案寫在答案卷上，違者不予計分。

I (16%) ***Multiple Choice Problem***: Please write down all correct choices (**at least one is correct**) in each problem.

1) Use Simplex method for a maximization LP problem.
(a) Minimum ratio test is used to identify the entering variable.
(b) The value of the objective function increases at every iteration unless a degenerate tableau is encountered.
(c) If there is no leaving variable at some iteration, then optimal value is $+\infty$.
(d) If there is no entering variable at some iteration, then this LP is infeasible.

2) Given a LP problem (P) and its dual problem (D)
(a) If (P) is feasible then (D) is also feasible.
(b) If (P) is infeasible then (D) is also infeasible.
(c) If (P) is unbounded then (D) is unbounded.
(d) If (P) has finite optimal solution then (D) also has finite optimal solution.

3)
(a) In a transportation problem with 4 sources and 6 destinations, with total supply exceeding total demand, the number of basic variables will be 10.
(b) In a transportation problem, if the total demand exceeds total supply, a "dummy" destination should be defined.
(c) Transportation problems always have integer optimal solution.
(d) The transportation problem is a special case of an assignment problem.

4) Use Branch and Bound Method for solving an linear BIP problem:
(BIP) $\{\max\ Z(\mathbf{x}) = \mathbf{c}^T\mathbf{x}$ s.t. $\mathbf{Ax} = \mathbf{b}$, $\mathbf{x}$: binary$\}$.
After some iteration, we obtain an incumbent solution $\mathbf{x}^I$.
(a) A subproblem can be fathomed if its LP relaxation 's optimal value $\geq Z(\mathbf{x}^I)$.
(b) A subproblem can be fathomed if its LP relaxation has no feasible solution.
(c) Optimal solution of (BIP) is found if the optimal solution $\mathbf{x}^L$ of one subproblem's LP relaxation is integer and $Z(\mathbf{x}^L) > Z(\mathbf{x}^I)$.
(d) (BIP) is infeasible if its LP relaxation has no feasible solution.

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II (36%) **Please answer following questions in the alphabetical order (a, b, c....).**

1) Transportation Problem:

		Destination 1	2	3	4	Supply	
Source	1	3 [3]	1 [2]	2	4	5	u_1
	2	5	2 [2]	3 [2]	6 [1]	4	u_2
	3	2	1	1	3 [2]	2	u_3
Demand		3	3	2	3		
		v_1	v_2	v_3	v_4		

(a) Why the above solution is a basic feasible solution?
(b) Let $u_1 = 0$, what is (u_2, u_3, v_1, v_2, v_3, v_4)?
(c) Is the above solution optimal? If your answer yes, please state your reason; otherwise please indicate what are the entering and leaving variables.

2) Consider the initial LP tableau for a maximization problem (Table 1). At a later iteration, besides Z, the basic variables are set as x_4, x_3, x_1, x_7 (in order), i.e., the basis is B = {4, 3, 1, 7} and the basis inverse matrix is given as Table 2.

Table 1

Z	x_1	x_2	x_3	x_4	x_5	x_6	x_7	b
1	-1	-15	-8	0	0	0	0	0
0	-1	-1	1	1	0	0	0	2
0	1	-1	1	0	1	0	0	1
0	2	10	1	0	0	1	0	5
0	0	-1	-2	0	0	0	1	10

Table 2

$$\begin{bmatrix} 1 & 1 & -1 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 2 & 0 \\ 0 & 2 & 0 & 1 \end{bmatrix}^{-1} = \begin{bmatrix} 1 & 3 & -1 & 0 \\ 0 & -2 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 4 & -2 & 1 \end{bmatrix}$$

(d) What is the current solution (x_1, x_2, x_3, x_4, x_5, x_6, x_7)?
(e) What is the current solution value Z?
(f) What are the coefficients of (x_2, x_5, x_6) in the Z row?
(g) Is the current solution a degenerate basic feasible solution? Why?
(h) Is the current solution optimal? Why?

3) Define decision variables as:

$$x_i = \begin{cases} 1, & \text{if we select object } i \\ 0, & \text{else} \end{cases}, \text{for } i = 1, 2, 3, 4$$

Please convert the following "logical constraints" into "linear constraints".
(i) Exactly 3 objects are selected.
(j) If object 1 is selected, then so is object 2.
(k) If object 3 is selected, then object 4 is not selected.
(l) Either object 2 is selected or object 3 is selected, but not both.

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系所：工管系
科目：生產管理

請依題號作答並將答案寫在答案卷上，違者不予計分。

1. Yuntech Co. has the following sales record for the past 12 periods. How will you predict the sale for the Yuntech Co. for the period 13? State clearly the prediction method and the prediction step you will use, and describe the method you will use to justify your prediction results. (Note: you do not need to calculate the exact prediction value) (20%)

Period	1	2	3	4	5	6	7	8	9	10	11	12
Sales	18	10	26	42	26	18	34	50	34	26	42	58

2. Determine the placement of the department for a facility that will minimize total transportation costs using the data in the following tables. Assume that reverse distances are the same. The locations are shown in the grid and a cost of $1 per trip yard is used. (20%)

	D	
A	B	C

Distance between locations (yards)

From-To	A	B	C	D
A	--	40	80	60
B		--	40	50
C			--	70
D				--

Number of trips between departments

From-To	1	2	3	4
1	--	10	20	80
2		--	40	90
3			--	55
4				--

3. Product A is made of two units of B, three units of C, and two units of D. B is composed of one unit of E and two units of F. C is made of two units of F and one unit of D. E is made of two units of D. Items A, C, D, and F have one-week lead times; B and E have lead times of two weeks. Lot-for-lot lot sizing is used for Items A, B, C, and D; Lot of size 50 and 180 are used for Items E and F, respectively. Item C has an on-hand inventory of 15; D has an on-hand inventory of 50; all other items have zero on-hand inventory. It is scheduled to receive 20 units of E in week 2; there are no other scheduled receipts. If 20 units of A are required in week 8, find the planned order releases for all components. (20%)

4. A total of 15 observations have been taken on a workstation. The numerical breakdown of the workstation's activity is listed in the following table. Based on the information, find the work sampling observation number that are required to determine how much of the workstation's time is spent in "Doing". Assume a 5 percent desired absolute accuracy and 95 percent confidence level. (20%)

Activity	Set up	Doing	Cleaning	Idle
Observation No.	2	6	3	4

5. A manager of the Yuntech Co. has to assign four engineers (A to D) to projects (1 to 4), one to a project. The leader of project 3 has indicated that he does not want engineer B or C on his project. Given the cost figures below for each engineer-project combination, please assign the engineers to projects for the Yuntech Co. to minimize total costs. (20%)

Engineer-Project	1	2	3	4
A	18	12	20	19
B	17	18	*	10
C	25	28	*	14
D	28	18	24	25

* undesirable

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系所：工管系
科目：計算機概論

1. 請解釋以下名詞 (25%)：
   (a) algorithm
   (b) encapsulation
   (c) inheritance vs composition
   (d) abstract data type (ADT)
   (e) polymorphism
   (f) applet
   (g) UML
   (h) multithreading
   (i) XML
   (j) ODBC

2. 假設有一網路圖書公司擬開發一套圖書線上訂購系統，其中有一模組爲「線上訂購」。透過此模組客戶可以「新增訂單」、「修改訂單」、「刪除訂單」、「取消訂單」、「查詢訂單」及「確認訂單」。完成訂購作業後，系統產生訂單的報表如下，請回答下列問題: (50%)

附表: 訂單

訂單					
訂單編號:		訂單日期:			
客戶編號:		客戶姓名:			
地址:					
電話:		傳真電話:			
產品編號:	產品名稱:	單位	單價:	數量:	金額:
總金額:					

甲、何謂系統開發的生命週期(SDLC, system development life cycle)？一般 SDLC 模型包括那些步驟？ (6%)

乙、線上訂購模組可歸納出幾種外部實體及資料實體？依據訂單內容，請詳列資料實體的屬性。(8%)

丙、請繪出線上訂購模組的第零階及第一階的資料流程圖(Data Flow Diagram)。(12%)

丁、從物件導向分析與設計的觀點，線上訂購模組可分爲那幾種類別？請繪出類別圖並設定類別的屬性及操作。(12%)

戊、針對(b) 中之資料實體，繪出實體關係圖及產生正規化後之關聯表。(12%)

3. 物件設計(25%)

等候線(Queue)泛指能以「先進先出」方式處理資料的物件，爲簡化問題起見，此處之資料暫指「實數」數值。

(a) 請以任何一種程式語言，設計實數等候線之「成員資料與結構」(data members or attributes) (10%)。

(b) 請使用(a)之結果，設計實數等候線的兩項成員函數(member functions or methods) (15%)：

void enqueue(float data)：將data加到等候線的尾端。

float dequeue( )：將等候線頂端的資料移出。

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系所：工管系

科目：微積分與線性代數

請依題號作答並將答案寫在答案卷上，違者不予計分。

I (10%) 判斷級數 $\sum_{n=1}^{\infty}(\frac{1}{n}-\ln\frac{n+1}{n})$ 之斂散性。

II (10%) 試繪 $f(x)=\frac{x^2}{x+1}$ 之圖形。

III (10%) 求 $\int e^{3x}\cos 2x dx$ 之值。

IV (10%) 求曲線 $y=\frac{x^3}{3}+\frac{1}{4x}$ 介於 $x=1$ 及 $x=3$ 之間的弧線繞 x 軸旋轉所得的曲面之表面積。

V (10%) $x^3+3x^2y+y^3=1$ 求 $\frac{dy}{dx}$ 及 $\frac{dy^2}{dx^2}$ 在 $x=0$ 之值。

VI Please write down **all correct** choices (**at least one is correct**) for each problem.

1) (6%) A, B, C: $n\times n$ matrix, I: $n\times n$ identity matrix, $\mathbf{0}$: $n\times n$ zero matrix.
(a) If $AB=CB$ and $B\neq\mathbf{0}$ then $A=C$.
(b) If $A^2=I$ then $A=I$.
(c) If $\det(AB)=\det(CB)$ then $\det(A)=\det(C)$
(d) If $AB=BC$ and $\det(B)\neq 0$ then $A=C$.
(e) If $\det(A)=0$ then the homogeneous system $A\mathbf{x}=0$ has infinite many solutions.

2) (6%) A, B, C: $n\times n$ matrix, k: scalar
(a) $AB=BA$.
(b) $(ABC)^T=C^TB^TA^T$
(c) $(ABC)^{-1}=C^{-1}B^{-1}A^{-1}$ (suppose A, B and C nonsingular)
(d) $(A^T)^{-1}=(A^{-1})^T$ (suppose A nonsingular)
(e) $\det(kA)=k\det(A)$

3) (6%) A: $n\times n$ nonsingular matrix, I: $n\times n$ identity matrix, $\mathbf{0}$: $n\times 1$ zero matrix.
(a) $A\mathbf{x}=\mathbf{0}$ has only trivial solution.
(b) A has nullity 0.
(c) The reduced row-echelon form of A is I.
(d) The row vectors of A span R^n.
(e) 0 is not an eigenvalue of A.

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科目：微積分與線性代數

4) (8%) $\mathbf{u} = (1,1,1)$, $\mathbf{v} = (0,1,1)$, $\mathbf{w} = (0,0,1)$, $S = \{\mathbf{u}, \mathbf{v}, \mathbf{w}\}$

(a) S is not a linear independent set.

(b) $\text{Proj}_u(\mathbf{v}) = \frac{2}{3}(0,1,1)$

(c) $\text{Proj}_u(\mathbf{w}) = \frac{1}{3}(1,1,1)$

(d) The angle between v and w is $\pi/4$

(e) $\text{Proj}_u(\mathbf{w}) \perp (\mathbf{w} - \text{Proj}_u(\mathbf{w}))$

5) (8%) Apply **the Gram-Schmidt process to** $S = \{\mathbf{u} = (1,1,1), \mathbf{v} = (0,1,1), \mathbf{w} = (0,0,1)\}$,

(a) $\mathbf{u}' = (1,1,1), \mathbf{v}' = (-\frac{2}{3},\frac{1}{3},\frac{1}{3}), \mathbf{w}' = (0,\frac{1}{2},\frac{1}{2})$ form an orthogonal basis for span(S).

(b) $\mathbf{u}' = (1,1,1), \mathbf{v}' = (\frac{2}{3},\frac{1}{3},\frac{1}{3}), \mathbf{w}' = (0,-\frac{1}{2},\frac{1}{2})$ form an orthogonal basis for span(S).

(c) $\overline{\mathbf{u}} = \frac{1}{\sqrt{3}}(1,1,1), \overline{\mathbf{v}} = \frac{\sqrt{6}}{3}(-\frac{2}{3},\frac{1}{3},\frac{1}{3}), \overline{\mathbf{w}} = \frac{1}{\sqrt{2}}(0,-\frac{1}{2},\frac{1}{2})$ form an orthonormal basis for span(S).

(d) $\overline{\mathbf{u}} = \frac{1}{\sqrt{3}}(1,1,1), \overline{\mathbf{v}} = \frac{\sqrt{6}}{3}(-\frac{2}{3},\frac{1}{3},\frac{1}{3}), \overline{\mathbf{w}} = \frac{1}{\sqrt{2}}(0,\frac{1}{2},\frac{1}{2})$ form an orthonormal basis for span(S).

(e) None of the above.

6) (8%) Given $A_1 = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 2 & 0 \\ -3 & 5 & 2 \end{bmatrix}$ and $P_1 = \begin{bmatrix} 1 & 0 & 1 \\ -1 & 0 & 0 \\ 8 & 1 & 0 \end{bmatrix}$

(a) $\det(A_1) = 4$.

(b) 1 and 2 are eigenvalues of A_1.

(c) (1,-1,8) is an eigenvector of of A_1.

(d) A_1 is diagonalizable.

(e) P_1 diagonalize A_1.

7) (8%) Given $A = \begin{bmatrix} 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 2 \\ 0 & 0 & 2 & 1 \end{bmatrix}$

(a) -3 is an eigenvalue of A.

(b) $\det(A) = 0$.

(c) $A(A+I_4)(A-2I_4)(A-3I_4) = \mathbf{0}_{4\times4}$

(d) (-1 1 0 0) is an eigenvector corresponding to eigenvalue 2.

(e) A is orthogonally diagonalizable.

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系所：工管系
科目：分析與推理

請依題號作答並將答案寫在答案卷上，違者不予計分。

注意：請盡量以圖、表方式，重點、摘要回答下列問題；切勿冗長繁瑣！(滿分 100 分)

問題一（60 分）

中正國際機場有一跑道供飛機起飛與降落，但飛機不可自行決定起降，而是必須聽命於中正機場之飛航管制。換言之，所有要降落在中正國際機場之飛機，在進入其飛航管制區後，必須聽命依序或盤旋或進場降落。當然在地面而欲起飛之飛機也須聽命於飛航管制依序起飛。

高雄國際港口有多個停泊卸貨碼頭，供貨輪靠港卸貨。碼頭可概分為三類，亦即貨櫃、散裝、及專用。其中散裝卸貨碼頭也可供貨櫃輪使用，只是其效率會大打折扣。而所謂專用碼頭是指裝卸原油、天然氣、煤炭、礦沙等原物料，因此貨櫃及散裝貨輪無法使用。所有各類之貨輪，在進入高雄港管制區後，必須聽命於港務管制局依序進出港口。

在上述二個管制單位之工作內，請進行：

1. 各挖掘出一個工業工程與管理（IE&M）專業可處理之問題。(10 分)
2. Formulate the problems professionally, i.e., in a way that IE&M professionals may communicate with each other. (30 分)
3. 比較此二問題之異同（換言之，無須找到二個完全不相干的問題)。(20 分)

問題二（40 分）

在工作中發現問題並提出改善方案是工業工程師必要的工作能力之一，此時，適時的敏銳力與創意是必須的；然而所提之方案其成效如何則需要應用嚴謹的分析方法來做驗證。請自行選定一提案（電話禮貌運動，公司內禁菸活動)，簡要回答：

1. 你將如何擬定進行該提案之執行計畫？（提示：由 5W1H 加以思考)(20 分)
2. 你將如何對所提之計畫其執行結果進行績效評估？(20 分)

國立雲林科技大學
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系所：工管系
科目：管理實務

請依題號作答並將答案寫在答案卷上，違者不予計分。

1. 請舉出貴機構的兩個主要的功能(Function)以及這些功能在貴機構追尋品質方面的貢獻。 (25%)

2. 請舉出貴機構的兩個問題以及說明可以運用何種品質管理活動解決相關問題。 (25%)

3. 產業經營管理實務中，有一重要課題，就是如何與顧客保持良好的關係，創造產業與顧客雙贏的最大利益。如果再深入思考，其實「顧客」，亦可以分為「外部」顧客與「內部」顧客。前者是泛指我們所熟悉的一般與產業有交易行為的顧客，後者則是從管理者的角度，來看待他/她的上司/同事/下屬。如果忽略了對內部顧客的關係管理，其後果甚至會較前者更嚴重。請針對此一重要產業經營課題—顧客關係管理，針對您的單位，提出整體(也就是包括內部與外部顧客)之說明：

   (1) 目前的作法以及有何問題亟待改善(15 %)，
   (2) 改善方案(20 %)，
   (3) 預期成效以及如何追蹤/考核所提之方案(15%)。

國立雲林科技大學
九十三學年度碩士班入學招生考試試題

系所：工管系、資管系
科目：統計學

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。

1. Roll a fair six-sided die three times. Let A = {1 or 2 on the first roll}, B = {3 or 4 on the second roll}, and C = {5 or 6 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

2. 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

3. 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

4. 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

5. 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

6. 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 $(\text{hours})^2$, 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 $(\text{hours})^2$. 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 $X_1, X_2, \ldots, X_5$ 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 $Y_1, Y_2, \ldots, Y_n$ is defined by
$$\text{C.V.} = S/\overline{Y}.$$
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 $\overline{Y}$ 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 $\overline{Y}$ is observed to be 5, the variation is quite large relative to the size of the mean. Let $Y_1, Y_2, \ldots, Y_{10}$ denote a random sample of size ten from a normal distribution with mean 0 and variance σ^2. Find the number c such that
$$p\left(-c \le \frac{S}{\overline{Y}} \le c\right) = 0.95.$$
(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:

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

$E(y)=\beta_0+\beta_1 x_1+\beta_2 x_1^2+\beta_3 x_2+\beta_4 x_1x_2+\beta_5 x_1^2x_2$ 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) $H_0:\beta_2=\beta_5=0$

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) $H_0 : \beta_2 = \beta_5 = 0$

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

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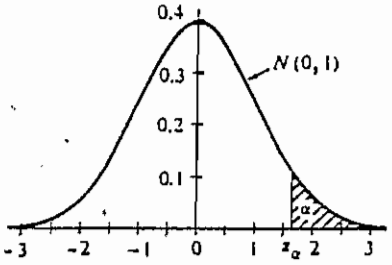
系所：工管系、資管系

科目：統計學

The Normal Distribution



$P(Z > z_\alpha) = \alpha$

$P(Z > z) = 1 - \Phi(z) = \Phi(-z)$

z_α	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641
0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002

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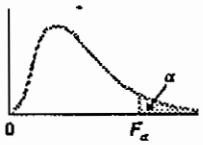
系所：工管系、資管系

科目：統計學

TABLE VIII
Values of F_α



dfd	α	dfn 1	2	3	4	5	6	7	8	9
	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
1	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
	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
2	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
	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
3	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
	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
4	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
	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
5	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
	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
6	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
	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
7	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
	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
8	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

國立雲林科技大學
九十三學年度碩士班入學招生考試試題

系所：財金系、工管所
科目：經濟學

請依題號作答並將答案寫在答案卷上，違者不予計分。

Part I. Microeconomics: 50% (each question 2.5 points), choose the best answer.

1. If you could exactly afford either 4 units of x and 27 units of y, or 9 units of x and 7 units of y, then if you spent all of your income on y, how many units of y could you buy?
   A) 23.
   B) 63.
   C) 43.
   D) 13.
2. John's indifference curves have the equation x_B=constant/x_A, where larger constants correspond to better indifference curves. John strictly prefers the bundle (6,15) to the bundle
   A) (15,6).
   B) (7,14).
   C) (11,13).
   D) (11,8).
3. Mary has the utility function $U(x_1,x_2)=\min\{x_1+2x_2, 2x_1+x_2\}$, where x_1: the number of corn chips, x_2: the number of French fries. She has $40 to spend on corn chips and French fries. If the price of corn chips is $2 per unit and the price of French fries is $2 per unit, then Mary will
   A) Consume at least as many as corn chips as French fries but might consume both.
   B) Definitely spend all of her income on corn chips.
   C) Definitely spend all of her income on French fries.
   D) Consume equal amounts of French fires and corn chips.
4. Charlie's utility function is $U(x_A,x_B)= x_Ax_B$. If Charlie's income were $40, the price of x_A were $2 and the price of x_B were $5, how many x_A would there be in the best bundle that Charlie could afford?
   A) 20.
   B) 10.
   C) 6.
   D) 5.

5. Elmer's utility function is $U(x,y)=\min\{x,y^2\}$. If the price of x is \$15, the price of y is \$30, and Elmer chooses to consume 2 units of y, what must Elmer's income be?
   A) \$1350.
   B) \$175.
   C) \$120.
   D) \$675.
6. Francis has an income of \$60 and a utility function $U(x,y)=20x^{1/2}+y$. The price of x is \$5 and the price of y is \$1. How many units of y will Francis demand?
   A) 10.
   B) 80.
   C) 4.
   D) 40.
7. If the interest rate is 15% and will remain 15% forever, how much would a rational investor be willing to pay for an asset that will pay him 3450 dollars 1 year from now, 1322 dollars 2 years from now, and nothing at any other time?
   A) \$4000.
   B) \$26666.67.
   C) \$64000.
   D) \$3000.
8. Suppose Peter can make up his portfolio using a risk-free asset that offers a rate of return of 10% and a risky asset with an expected rate of return of 20% and with standard deviation 5. If he chooses a portfolio with an expected rate of 20%, then the standard deviation of his return on this portfolio will be
   A) 2.5%.
   B) 8%.
   C) 5%.
   D) 10%.
9. Alice has a demand function for mead that is given by the equation $D(p)=100-p$. If the price of mead is \$85, how much is Alice's net consumer's surplus?
   A) 112.5.
   B) 15.
   C) 225.
   D) 200.

10. The demand function for apples is given by $D(p)=(p+1)^{-2}$. If the price of apples is \$4, then the price elasticity of demand is
A) –1.50.
B) –1.16.
C) –0.32.
D) –4.80.

11. The inverse demand function for bananas is defined by the equation p=136-4q, where q is the number of units sold. The inverse supply function is defined by p=16+4q. A tax of \$16 is imposed on suppliers for each unit of bananas that they sell. When the tax is imposed, the quantity of bananas sold falls to
A) 13.
B) 11.
C) 15.
D) 16.

12. Bob applies N pounds of fertilizer per acre, the marginal product of fertilizer is 1-(N/200) bushels of corn. If the price of corn is \$1 per bushel and the price of fertilizer is \$0.40 per pound, then how many pounds of fertilizer per acre should Bob use in order to maximize his profits?
A) 64.
B) 120.
C) 240.
D) 200.

13. Nadine has a production function 5x+y. If the prices of x is \$10 and the price of y is \$3, how much will it cost her to produce 70 units of output?
A) \$1960.
B) \$3170.
C) \$140.
D) \$210.

14. If Mr. Dent Carr's total costs of repairing s cars is $4s^2+40s+20$, then if he repairs 10 cars, his average variable costs will be
A) \$120.
B) \$82.
C) \$160.
D) \$80.

15. If Mr. Dent Carr's long run total costs of repairing s cars per week is $3s^2+108$. If the price he receives for repairing a car is $24, then in the long run, how many cars will he fix if he maximizes profits?
A) 0.
B) 4.
C) 8.
D) 12.

16. A profit-maximizing monopoly faces an inverse demand function described by the equation $p(y)=60-y$ and his total costs are $c(y)=10y$. In the past it was not taxed, but now it must pay a tax of $4 per unit of output. After the tax, the monopoly will
A) Increase its price by $4.
B) Leave its price constant.
C) Increase its price by $2.
D) Increase its price by $8.

17. Goods A has the demand $Q_1=18000-900p_1$ in the United States and the demand $Q_2=2000-200p_2$ in England, then the difference between the price charged in the United States and the price charged in England will be.
A.) $10.
B.) $0.
C.) $11.
D.) $5.

18. Which of the following statements about game theory is true?
A) A situation where everyone is playing a dominant strategy must be a Nash equilibrium.
B) In the prisoner's dilemma game, if each prisoner believed that the other prisoner would deny the crime, then both would deny the crime.
C) A two-person game in which each person has access to only two possible strategies will have at most one Nash equilibrium.
D) If a game does not have equilibrium in pure strategies, then it will not have equilibrium in mixed strategies either.

19. The following relationship must hold between the average total cost (ATC) curve and the marginal cost curve (MC):
A) If MC is rising, ATC must be rising.
B) If MC is rising, ATC must be grater than MC.
C) If MC is rising, ATC must be less than MC.
D) If ATC is rising, MC must be greater than ATC.

20. A firm has the long run cost function $C(q)=3q^2+27$. In the long run, it will supply a positive amount of output, so long as the price is greater than
A) $36.
B) $44.
C) $9.
D) $18.

國立雲林科技大學
九十三學年度碩士班入學招生考試試題

系所：財金系、工管所
科目：經濟學

Part II、Macroeconomics(50%)

1. 有二組資料如下表:

I 組	所得	II 組	所得
A	100	a	200
B	700	b	250
C	750	c	300
D	800	d	700
E	850	e	800

(1) 請算出以上二組資料的吉尼係數(5%)
(2) 請畫出二條羅倫茲曲線(5%)
(3) 那一組所得分配較平均？爲什麼？(5%)

2. 請利用總供需的架構說明新興古典學派、新興凱因斯學派、與實質景氣循環理論不同的觀點。(10%)

3. 試述當期可支配所得、預期可支配所得、以及利率如何影響家戶的消費與儲蓄？(10%)

4. 設某封閉經濟體系，消費 C=100+0.75(Y-T)，投資 I=200-40i， 政府支出 G=400，稅收 T=100。並且，實質貨幣需求 L(i，Y)=500+0.4Y-100i，名目貨幣供給量爲 600 億元，i 的單位爲%，Y 的單位爲億元。請找出總需求曲線方程式，並畫出其圖形。(8%)

5. 設以 IS-LM 架構說明何謂投資陷阱？何謂流動性陷阱？ (7%)