



1. For each one question, choose the right one answer of the five possible selections.(30%)

(1) In the Transportation Problem with  $m$  suppliers and  $n$  demands (where the supply equals the demand), there are how many basic variables? 1.  $n$  2.  $m$  3.  $n+m$  4.  $n-m$  5.  $n+m-1$ .

(2) If a linear programming problem with one optimal solution, why the optimal solution must be a corner point feasible solution? 1. the feasible region is limited 2. the feasible region is unlimited 3. the feasible region is a concave set 4. the feasible region is a convex set 5. the feasible region is finite.

(3) In general what the most important and difficult step of an OR study in the real world situations? 1. sensitive analysis 2. find the solution of the model 3. formulate and define the problem 4. generate the alternatives 5. Construct the mathematical model.

(4) Which of the following is not in the realm of the network problem? 1. PERT 2. scheduling 3. minimum spanning tree 4. minimum cost flow 5. the shortest path.

(5) Which of the following network problem tool is most frequently applied in Taiwan? 1. PERT 2. scheduling 3. minimum spanning tree 4. minimum cost flow 5. the shortest path.

(6) In Decision Analysis, to select the action which minimizes the expected loss is called 1. stochastic process 2. simulation 3. minimax principle 4. maxmini principle 5. Bayes' principle.

(7) When were operations research tools started to be applied in business? 1. early 20<sup>th</sup> century 2. 1980s 3. 1960s 4. 1940s 5. 1920s.

(8) The Transportation Problem is a special type of 1. Goal Programming 2. Decision Analysis 3. Linear Programming 4. Nonlinear Programming 5. Network Problem.

(9) Which one of the following is not the assumption of a linear programming problem? 1. additive 2. reliability 3. proportionality 4. divisibility 5. certainty.

(10) In the augmented form of a linear programming problem with  $m$  constraints,  $n$  variables, and  $m$  slack variables in addition to the  $n$  variables, there are how many degrees of freedom? 1.  $n$  2.  $m$  3.  $n+m$  4.  $n-m$  5.  $n+m-1$ .



2. (A) 假想今天您要到某公司應徵工作，而必須與人事部主任面談，人事部主任發現您曾在大學修過一門 Operations Research 的課程，但是他對作業研究完全陌生，請用他可以了解的話語。(10%)

(1) 介紹作業研究是什麼？(2) 您如何用作業研究來幫助公司的經營？

(B) 請將下列問題轉變成 Standard Form，並找出起始解。(10%)

$$\text{Min } Z = 2X_1 + X_2 + 3X_3 - 5X_4$$

$$\text{S.T } 5X_1 + 2X_2 + 7X_3 + X_4 = 420$$

$$3X_1 + 2X_2 + 5X_3 - 2X_4 \geq 280$$

$$X_1 + X_3 \leq 200$$

$$X_1, X_2 \geq 0, X_3 \geq -20, X_4 \text{ 無符號限制}$$

3. Define the states and draw the transition rate diagram of the following systems and write down the balance equations of each system. (30%)

a. The system consists of two parallel queues, queue 1 and queue 2. Each queue has one server. Service times for queues 1 and 2 are exponential distributed with rates  $\mu_1$  and  $\mu_2$ , respectively. Customers enter the system according to a Poisson process with rate  $\lambda$ . With the rule of join the shortest queue, a customer selects the queue to join. When the two queues are of equal size, with probability 0.25 a customer will join queue 1 and with probability 0.75, he will join queue 2. (15%)

b. The system consists of 2 queues in series with 2 waiting space between queue 1 and queue 2 (not counting the spaces for service either in queue 1 or queue 2). Each queue has one server. Service time at queue 1 is exponential with rate  $\mu_1$  and service time at queue 2 is exponential with rate  $\mu_2$ . Customers enter the system according to a Poisson process with rate  $\lambda$ . Upon entrance, a customer goes to queue 1 for service. At the completion of service at queue 1, he goes to queue 2 for service if there is waiting space in front of queue 2. Otherwise he remains in queue 1 and blocks the service of queue 1. (15%)



4. Consider a Markovian deteriorating machine with the following states: good, average and bad. The revenue generated by the machine per day is 100, 80 or 30 when the machine is in good, average or bad state, respectively. When the machine state is good at the beginning of a day, then its state will transit to good or average state at the beginning of the next day with probabilities 0.8 and 0.2, respectively. When the machine state is average at the beginning of a day, then, its state will transit to average or bad at the beginning of the next day with probabilities 0.8 and 0.2, respectively. When the machine state is bad at the beginning of a day, a repairman is called in to repair the machine immediately. The repair will take up one day. There are 2 repairmen, A and B for the repair job. Repairman A charges 20 for his work and repairman B charges 10. When the repair is performed by repairman A, the repaired machine will be in good state the next day. If the repair is done by repairman B, then with probability 0.8, the machine will be in good state after repair and with probability 0.2, the state is average after repair. Which repairman should be chosen for the repair job? Why? (20%)



- 解釋下列名詞：(共計 30 分)
  - Delayed Differentiation (5 分)
  - Job Shop and Flow Shop (5 分)
  - MPS and ATP (5 分)
  - Aggregate Plan (5 分)
  - CR Rule (5 分)
  - Planned-Order Receipts and Planned-Order Releases (5 分)

- 某物流公司所屬的轉運站(A, B, C, D, E)運送出入流量及轉運站之位置座標如下 From-To 表所示。(共計 20 分)

		位置座標: (x, y)	TO					單位運輸成本
			A	B	C	D	E	
F	A	(0.00, 5.00)	—	25	175	30	98	10
R	B	(8.00, 10.00)	60	—	90	0	75	20
O	C	(10.00, 0.00)	70	85	—	80	20	40
M	D	(未知)	100	80	120	—	200	50
	E	(3.00, 3.00)	20	90	35	150	—	45

- 若不考慮單位運輸成本之下，以 Center of Gravity 法，求轉運站 D 之最佳位置座標為何？(座標值取兩位小數，餘四捨五入計) (6 分)
  - 若考慮單位運輸成本之下，以 Center of Gravity 法，求轉運站 D 之最佳位置座標為何？(座標值取兩位小數，餘四捨五入計) (6 分)
  - 依照(a)小題的題意及資料，列出 Center of Gravity 法之目標函數及決策變數。(8 分)
- 某書報攤統計今年二月份(共計 28 天)每天報紙需求量如下表。假設報紙進貨成本每份 7 元、報紙售價每份 15 元、當日未售出的報紙則均以廢紙賣出，每份 0.2 元。(共計 15 分)

星期	一	二	三	四	五	六	日
需 求 量	—	—	—	—	25	30	40
	15	25	30	25	30	35	30
	25	15	15	30	25	30	35
	30	25	30	15	35	40	30
	15	25	35	30	—	—	—

- 若依照 Discrete Single Period Inventory Model 分析，求報紙的最佳進貨量。(5 分)
- 若依照 Continuous Single Period Inventory Model 分析，且假設需求量在該月最大值與最小



值之間呈現 Uniform Distribution，求報紙的最佳進貨量。(5分)

- (c) 試以一通式表達該書報攤二月份報紙銷售實際獲利值( $Z$ )。假設該書報攤二月份每日固定進貨量為  $p$ ，該月每日報紙銷售量為  $a_i, i = 1, 2, \dots, 28$ 。報紙進貨成本每份  $n$  元、報紙售價每份  $m$  元、當日未售出的報紙則均以廢紙賣出，每份  $q$  元。(5分)
4. 某公司自製之 A 零件採批量生產。A 零件基本資料如後：年需求量 4000 個，每批量生產之準備成本(Setup Cost)為 500 \$/次，每批量生產之準備時間(LT)需兩天，A 零件每單位存貨成本為 40 \$/年，生產速率為 80 個/天。假設一年有 200 工作天，每天均需穩定消耗 A 零件。(共計 20 分)
- (a) 試求 A 零件之經濟生產批量 (EPQ)? (4 分)
- (b) 試求 A 零件之平均庫存量? (4 分)
- (c) 試求每年停止生產 A 零件之總天數? (4 分)
- (d) 依照 A 零件之批量生產策略下，每批量開始生產時庫存量為何? (4 分)
- (e) 若 A 零件每天之耗用量均呈常態分配：平均值為 20 個、標準差為 4 個。A 零件之服務水準定為 97.5% ( $Z=1.96$ )，則這種狀況下，A 零件之最高庫存量為何? (4 分)

5. Chuck's Custom Boats (CCB) builds luxury yachts to customer order. CCB has landed a contract with a mysterious New York lawyer (Mr. T). Relevant data are shown below. The complication is that Mr. T wants delivery in 32 weeks or he will impose a penalty of \$375 for each week his yacht is late.

Activity	Precedes	Normal Time (Weeks)	CRASHING COSTS	
			1 <sup>st</sup> Week	2 <sup>nd</sup> Week
K	L, N	9	\$410	\$415
L	M	7	125	—
N	J	5	45	45
M	Q	4	300	350
J	Q	6	50	—
Q	P, Y	5	200	225
P	Z	8	—	—
Y	End	7	85	90
Z	End	6	90	—

Develop a crashing schedule. (共計 15 分)



每題 10 分

- 1) 求方程式  $6xy - y^4 - 3 = 0$  從點  $(\frac{19}{12}, 2)$  到  $(\frac{14}{3}, 3)$  的曲線長度。
- 2) 若方程式  $y = \frac{b}{x^2}$  在  $x = -2$  時，有切線  $4y - bx - 21 = 0$  存在，則求  $b$  值為何？
- 3)  $f(x) = |x + \sin x|$ ， $x \in [-\frac{\pi}{2}, \frac{\pi}{2}]$  時，請找出此函數的極大、極小值和所對應的  $x$  值。
- 4) 找出級數  $\sum_{k=1}^{\infty} \frac{1}{k \cdot 2^k} x^k$  的收斂區間。
- 5) 找出  $f(x, y) = x^4 + y^4 - 4xy$  的所有相對極值。
- 6) If  $A = \begin{pmatrix} 1 & 0 \\ 1 & 1 \end{pmatrix}$ , is  $A$  diagonalizable (對角化)?
- 7) If  $A = \begin{pmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{pmatrix}$ , find the determinant (行列式).
- 8) If  $H = I_n - 2ww^t$ , where  $w$  is a  $n$ -dimensional column vector with  $w^t w = 1$ , find the inverse of  $H$ .
- 9) If  $M = \begin{pmatrix} .75 & .4 \\ .25 & .6 \end{pmatrix}$ , find the steady-state vector (穩定狀態) of  $M$ .
- 10)  $P_2[t] = \{at^2 + bt + c \mid a, b, c \in \mathbb{R}\}$ ,
  - a) Is  $\{1, t-1, (t-1)^2\}$  linearly independent (線性獨立)?
  - b) Find the dimension of  $P_2[t]$ .


**I. (80%) Multiple Choice Questions** (For each question, select only one best answer.)

1. A machine is used in a production process. From past data, it is known that 90% of the time the machine is set up correctly. Furthermore, it is known that if the machine is set up correctly, it produces 95% acceptable (nondefective) items. However, when it is set up incorrectly, it produces only 40% acceptable items. One day, two items from the production process are selected. Given that the two selected items are nondefective, what is the probability that the machine is set up incorrectly?

(a) 0.0052    (b) 0.0089    (c) 0.0135    (d) 0.0168    (e) 0.0193

2. Which of the following is not necessarily true for a continuous probability density function  $f(x)$ ?

(a)  $\int_{-\infty}^{\infty} f(x)dx = 1$     (b)  $f(x) \geq 0$     (c)  $f(x) \leq 1$   
 (d)  $P(a \leq X \leq b) = P(a < X < b)$     (e) None of the above answers is correct.

3. If the moment-generating function of  $X$  is

$$M(t) = \frac{2}{5}e^t + \frac{1}{5}e^{2t} + \frac{2}{5}e^{3t},$$

then the variance of  $X$  is

(a) 0.4    (b) 0.5    (c) 0.6    (d) 0.7    (e) 0.8

4. Let the pdf of  $X$  be  $f(x) = 1 - |x - 1|$ ,  $0 \leq x \leq 2$ . The value of  $P(X \leq 3/2)$  is

(a) 3/8    (b) 1/2    (c) 5/8    (d) 7/8    (e) 1

5. Let  $X$  equal the number of bad records in each 100 feet of a used computer tape. Assume that  $X$  has a Poisson distribution with mean 2.5. Let  $Y$  equal the number of feet before the first bad record is found. The  $P(Y > 60 | Y > 20)$  is

(a)  $e^{-1/2}$     (b)  $e^{-1}$     (c)  $1 - e^{-1/2}$     (d)  $1 - e^{-1}$     (e) else

6. Let  $X_1, X_2$  be two independent random variables, each with Binomial distribution  $B(2, 1/3)$ . For  $Y = X_1$  and  $W = X_1 + X_2$ , the correlation coefficient of  $Y$  and  $W$  is

(a) 0    (b)  $\sqrt{2}/4$     (c)  $\sqrt{2}/3$     (d)  $\sqrt{2}/2$     (e) 1



7. Let  $X_1$  and  $X_2$  be independent random variables, each with pdf  $f(x) = e^{-x}$ ,  $0 < x < \infty$ . Let  $Y_1 = X_1 - X_2$  and  $Y_2 = X_1 + X_2$ . The marginal pdf of  $Y_2$  is  
 (a)  $1/2 \exp(-y_2)$  (b)  $1/2 \exp(y_2)$  (c)  $y_2 \exp(-y_2)$  (d)  $y_2 \exp(y_2)$  (e) else
8. Let  $X_1$ ,  $X_2$ , and  $X_3$  be mutually independent random variables with Poisson distributions having means 2, 1, 4, respectively. For  $Y = X_1 + X_2 + X_3$ , the probability of  $P(3 \leq Y \leq 9)$  is  
 (a) 0.80 (b) 0.81 (c) 0.82 (d) 0.83 (e) 0.84
9. Let  $X_1, X_2, \dots, X_{48}$  be a random sample of size 48 from the distribution with pdf  $f(x) = 1/x^2$ ,  $1 < x < \infty$ . The approximate probability that at most 10 of these random variables have values greater than 4 is  
 (a) 0.3081 (b) 0.3082 (c) 0.3083 (d) 0.3084 (e) 0.3085
10. Suppose that  $E(\theta_1) = E(\theta_2) = \theta$ , and  $V(\theta_1) = V(\theta_2) = \sigma^2$ . A new unbiased estimator is  $\theta_3 = a\theta_1 + (1-a)\theta_2$ . Assume  $\theta_1$  and  $\theta_2$  are independent, what is the constant  $a$  to minimize the variance of  $\theta_3$ .  
 (a) 1/4 (b) 1/2 (c) 2/3 (d) 3/4 (e) 4/5
11. Let  $X_1, X_2, \dots, X_n$  be a random sample from a uniform distribution on the interval  $(\theta - 1, \theta + 1)$ . Given the following observations for  $n=5$ : 6.61 7.70 6.98 8.36 7.26, the point estimate of  $\theta$  for the method of moments estimator is  
 (a) 7.381 (b) 7.382 (c) 7.482 (d) 7.484 (e) 7.485
12. A machine which produces a major part for an airplane engine is monitored closely. In the past, 10% of the parts produced would be defective. With a 0.95 probability, what is the sample size that needs to be taken if the desired sampling error is 0.05 or less?  
 (a) 136 (b) 137 (c) 138 (d) 139 (e) 140
13. Suppose that in a single-factor ANOVA table which was the results of three treatments and a total of 15 observations, the sum of square of total and the sum of square of error are 160 and 96, respectively. The computed test statistic is  
 (a) 3.33 (b) 4 (c) 4.33 (d) 5 (e) 5.33





14. The table below gives beverage preferences for random samples of teens and adults.

	Teens	Adults
Coffee	50	200
Tea	100	150
Soft Drink	200	200
Other	50	50

We are asked to test for independence between age, (i.e., adult and teen) and, drink preferences. The calculated Chi-square value for this test for independence is

- (a) 62.5 (b) 67.5 (c) 72.5 (d) 77.5 (e) 82.5

15. You are given the following information about  $x$  and  $y$ :

Dependent Variable ( $y$ )      Independent Variable ( $x$ )

5

15

7

12

9

10

11

7

The sum of squares (due to the regression (SSR)) equals

- (a) 277.35 (b) 284.38 (c) 289.51 (d) 293.72 (e) 297.59

16. For the data given in Question 15, the coefficient of determination equals

- (a) 0.9644 (b) 0.9758 (c) 0.9839 (d) 0.9986 (e) 1.0018



## II. Problems (20%)

1. (10%) In a lottery game, a player selects 6 integers out of the first 42 positive integers. Cash prizes are given to a player who matches 4, 5, or 6 integers with the six randomly selected winning numbers. Let  $X$  equal the number of integers selected by a player that match the winning numbers.

(a) Find the distribution function of  $X$ .

(b) What value of  $X$  is most likely to occur?

(c) A mathematics professor convinced some colleagues to pool their lotto bets so that they were able to purchase 138 tickets together. Their numbers are selected randomly by a computer at the betting station. Among their 138 bets, 65 matched 0 of the winning numbers {3, 12, 16, 26, 34, 36}, 55 matched 1, 16 matched 2, and 2 matched 3 numbers. How do these results compare with what they could have expected?

2. (10%) Let the random variable  $X$  have the probability density function

$$f(x) = \lambda e^{-\lambda x}, \quad x > 0,$$

and the random variable  $Y = 1 - e^{-\lambda X}$ .

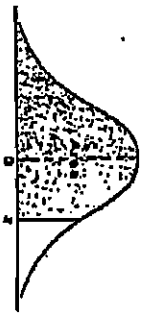
(a) Find the probability density function of  $Y$  (i.e.,  $f(y)$ ).

(b) Determine the mean and variance of  $Y$ .



Table A.3 (continued) Areas Under the Normal Curve

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.9015	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9278	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9980	0.9981	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998





總分為 100 分

## 病歷管理

一般人去醫院看病時可預約掛號或現場掛號。到醫院看診時，病人尚須等病歷室將他的病歷送至醫生之門診處，醫生才會叫病人入內問診。診治完畢後，病歷需送回病歷室。而該次診治所產生之相關表單如驗血單、驗尿單、或 X 光片等，病歷室工作人員會將之黏貼或夾附在病人之病歷中，最後病歷歸檔於病歷架上之原來位置。

大家都有在門診處前久等病歷的經驗，而縮短病歷送達時間，是醫院與病人之共同心願，亦是本題之問題。

假設你要設計一病歷管理軟體系統，而系統之目的就是幫助病歷室工作人員，以最短時間處理病歷之相關事務。其所需之硬體是一個人電腦，且與掛號處以網路相連，因此病歷室可接收到病人之掛號單。每一掛號單上載有病人的姓名及病歷號碼（假設為十碼）。病歷依病歷號碼之最後一碼，分別置於不同之病歷架上。若某一碼（最後一碼）之病歷太多，則可再依病歷號碼之最後第二碼加以區別，並置於不同之位置。並依此類推。

無論是預約掛號或現場掛號，病歷之檢取始於病人到醫院看診時之當天，並結束於病歷之歸檔。若這是病歷管理之範圍，請問在這範圍內你可辨識出多少個問題。敘述問題的內容、問題與問題之相關性、每一問題之數學模式（如果可以表示的話）及其解決方法。

病歷管理範圍內之相關問題，以工業工程與管理觀念及手法解決後，才可進行軟體系統之設計與製作。以你所知的方法敘述此一軟體系統，如此才能指揮軟體製作人員進行工作。例如，可用傳統系統分析與設計之方法與工具，或是用物件觀念，如 UML 的語法，來敘述。

答題時，盡可能多用流程圖或其他相關之圖表等來闡訴你的想法。



## 一、管理實務規劃能力(50%)

最近朝野所關心的熱門政策之一，就是政府應不應該開放業者赴大陸設八吋晶圓廠。在眾多各式各樣的正反意見之中，包含有：反對方擔心製造技術與管理知識外流而造成產業空洞化，甚至整個在台灣相關產業的上中下游的供應鏈最終會全部外移，而失去競爭力。支持方擔心彼岸已成為全球供應鏈的製造中心(甚至是消費/市場中心)，所有產業中，只要有需要製造的區段，幾乎都已(或即將)移至大陸，因此我們如果不趕快進入此一地區，確保此一供應鏈的製造區段，否則將永無競爭力矣。兩方雖然立場分歧，但是共同的之處就是，大家都同意：加入全球供應鏈體系是我國經濟發展的重要出路，但是如何在發展的過程中，不單不會失去，甚至更能使相關產業競爭力能成長，則是大家所共同關心的。

請任舉一產業在加入全球供應鏈體系中為實例：

1. 針對此實例，提供必要之基本產業相關資料(5%)。
2. 說明並解釋此產業之供應鏈核心競爭力為何(10%)。
3. 規劃如何管理這些競爭力，並解釋為何你的規劃是有效的(20%)。
4. 規劃如何提升這些競爭力，並解釋為何你的規劃是有效的(15%)。

## 二、管理實務提昇能力(50%)

由於世界經濟景氣的下降，再加上我國在 2002 年元月正式成為世界貿易組織 (World Trade Organization, WTO) 的一員，導致我國不少企業面臨嚴苛的產業競爭。國內企業因應這一波的產業衝擊，有的採取遷廠大陸或東南亞國家，以期充分利用外地低廉的勞力或土地資源，有的企業仍然堅持在國內繼續奮鬥。

過去我國政府為使產業根留台灣，採取了戒急用忍政策，然而效果似乎有限；而另一可能的途徑則是促使國內的產業升級，加強研發與創新。然而，欲塑造一個好的研發與創新的環境則必須有一個優良的企業文化，合理的管理制度與清晰的公司共同願景。

由於國內大部分的企業為中小企業，管理制度一向不甚完善，然而，為提昇公司的競爭力，剛被公司升為管理中心主任的您，欲提出一個改善公司體質，提昇公司競爭力的企劃案。



由於您服務的機構是傳統產業，過去甚少推行管理專案，而剛獲得拔擢的您，平時雖然經常閱讀管理相關的書籍或雜誌，然而，對於推動此類管理提昇專案亦是一知半解。於是，您向業界打聽，得知，近十年來，國立雲林科技大學工業工程與管理研究所的教授群，累積了不少管理理論與輔導實務經驗，可以提供您推動此方案的諮詢。

於是，您風塵僕僕的來到雲林科技大學，花了五天的時間，與相關的教授仔細的討論，並收集了足夠的資訊以供您寫一份提昇公司競爭力的企劃專案。

由於公司大部分的部門主管一向只鑽研技術方面的知識，對於管理的相關知識一向欠缺，因此，您在決定採取何種管理提昇方案之前，必須先就這些管理方案為各部門主管做一簡介。

以下是您欲建議公司採行的提昇競爭力管理專案，試就您所了解和收集到的資訊，針對各管理專案可能的定義、目的、精神、內涵、理念、方法或工具，做一簡單介紹：

1. 全面品質管理〈Total Quality Management, TQM〉。(12%)
2. 學習型組織〈Learning Organization〉。(12%)
3. 知識管理〈Knowledge Management, KM〉。(12%)
4. 回到現實面，請就您服務機構的規模、特性、產業競爭程度及可能遭遇的阻礙或困難等因素，建議您的服務機構優先或同時採用以上您所提到的管理專案，試敘其理由。(或您若有其他更適合您的服務機構採用的管理專案亦可！)(14%)

[註]切勿將您的姓名、您所服務的機構或單位名稱，明示或暗示的呈現出來。



## 一、單選題 (每題 2 分 共 40 分)

1. 物件導向程式語言中，儲存物件屬性值的記憶體是配置給以下哪一種變數？
  - (A) local variable
  - (B) global variable
  - (C) class variable
  - (D) instance variable
2. 以下有關功能式程式設計 (functional programming) 的敘述何者正確？
  - (A) 程式中變數的值不能改變
  - (B) C 語言不能以功能式程式設計的方式撰寫程式
  - (C) while loop 常常使用在以功能式程式設計方式撰寫的程式中
  - (D) 功能式程式語言的變數必須先宣告其型態後才能使用
3. 以下哪一個指令是 Unix 系統下，列出目錄內之檔案的詳細內容的指令？
  - (A) ld -al
  - (B) ld -all
  - (C) ls -al
  - (D) ls -L
4. 以下哪一個指令是 Unix 系統下，更改檔案存取權限的指令？
  - (A) chmod
  - (B) chacs
  - (C) chright
  - (D) chown
5. 以下有關 Apache 軟體的描述何者正確？
  - (A) Apache 是要付費才能使用的軟體
  - (B) Apache 是一個網路管理軟體
  - (C) Apache 是 HTTP 的伺服器
  - (D) Apache 在微軟的視窗作業系統上不可以使用
6. 以下哪一個程式語言不常用來撰寫網路應用程式？
  - (A) Apl
  - (B) Python
  - (C) Perl
  - (D) JSP



7. 以下有關 CGI 的描述何者正確？
- (A) CGI 是一個網路應用程式的名稱。
  - (B) CGI 是一個網路應用程式與 HTTP 伺服器溝通的標準介面
  - (C) Java 語言不能用來撰寫 CGI 的程式
  - (D) ASP 常被用來撰寫 CGI 的程式
8. 以下有關 Java 程式語言的敘述何者不正確？
- (A) 一個 Java 程式使用到的 class 需要在該程式執行前都載入 Java 的 virtual machine 中
  - (B) Java 程式在執行時由於有 automatic garbage collection 的功能所以不會有 memory leak 的現象
  - (C) Just-in-time compilation 是提升 Java 程式執行效率的技術
  - (D) Java 不支援 multiple inheritance
9. 以下有關多執行緒 (multiple threads) 的敘述何者不正確？
- (A) Java 支援多執行緒的功能
  - (B) 不同的 thread 有個別的地址空間 (address space)
  - (C) Multiple threads 也是分時 (time sharing) 執行的一種方式
  - (D) 不同的 thread 可以分享同一 process 內的地址空間
10. 以下有關程式語言中型態 (type) 的描述何者不正確？
- (A) C 語言不能在 compile-time 找出所有變數型態誤用的錯誤
  - (B) Dynamic type 的語言在程式執行時才檢查型態誤用的錯誤
  - (C) Perl 是一個 dynamic type 的語言
  - (D) 陣列存取超越界線(array reference out of bound)是一種在執行時發生的型態錯誤 (type error)
11. 下列哪一種方式是區域網路與廣域網路皆可以使用的？
- (A) ATM
  - (B) ASL
  - (C) ISDN
  - (D) Frame Relay
12. 下列哪一種 Sort 在資料量大時比較花時間？
- (A) Quick Sort
  - (B) Merge Sort
  - (C) Insert Sort
  - (D) Heap Sort
13. 下列有關 .NET Framework 之敘述何者不正確？
- (A) 它是利用 MSIL(Microsoft Intermediate Language)所發展出的程式開發平台
  - (B) 它支援微軟所開發的 Visual C++程式語言
  - (C) Visual Studio .NET 是支援.NET Framework 的開發環境
  - (D) ASP(Active Server Pages)程式無法在.NET Framework 上執行





14. C語言函數fun之定義如下：

```
char *fun(char *s1, const char *s2)
{
    register char *p = s1 + 2;
    while (*p)
        ++p;
    while (*p++ = *s2++)
        ;
    return s1;
}
```

試問 fun(“abcd”, “efgh”) = ?

- (A) efgh            (B) cdefgh            (C) efghabcd            (D) abcdefgh

15. 下列有關日本 NTT DoCoMo 無線上網服務(i-mode)之敘述何者不正確？

- (A) 此種服務具有價格便宜輕鬆使用的優點  
 (B) 此種服務可以做到個人認證服務  
 (C) 此種服務的網頁是利用 WML 語言來編寫的  
 (D) 此種服務是利用封包來傳送訊息的

16. 下列有關 ER Model Concepts 之敘述何者不正確？

- (A) The ER model describes data as entities, relationships, constraints, and attributes.  
 (B) The basic object that the ER model represents is an entity, which is a “thing” in the real world with an independent existence.  
 (C) A relationship type R among n entity types  $E_1, E_2, \dots, E_n$  defines a set of associations among entities from these types.  
 (D) Relationship types usually have certain constraints that limit the possible combinations of entities that may participate in relationship instances.

17. 下列有關 Operating Systems 之敘述何者不正確？

- (A) Traditional a process contained a single thread of control as it ran, most modern operating systems now support processes that have multiple threads.  
 (B) Most modern computer systems use disks as the primary on-line storage medium for both programs and data.  
 (C) The First-come, first-served algorithm is preemptive; the Round-robin algorithm is nonpreemptive.  
 (D) Operating systems are now almost always written in a systems-implementation language or in a higher-level language.



18. 下列有關 Expert Systems 之敘述何者不正確？
- (A) The area of expert systems is a very successful approximate solution to the classic AI problem of programming intelligence.
  - (B) An explanation facility is an integral part of sophisticated expert systems..
  - (C) One of the most popular types of expert systems today is the rule-based systems.
  - (D) PROLOG is a good example of a forward chaining system that tries to solve a problem by breaking it up into smaller subproblems and solve them individually.
19. 下列有關 C++之敘述何者不正確？
- (A) A reference is an alternative name, or alias, for an object which is currently in scope.
  - (B) A friend function is a non-member of a class which is given access to the public members of the class.
  - (C) Polymorphism is defined as having several forms, and in C++ means that some object refers to instances of various classes at run-time.
  - (D) Exceptions provide a means whereby a function, upon identifying an error situation for which it is unable to determine what is the correct course of action, can report this position to the calling function.
20. 下列有關 Electronic Commerce(EC)之敘述何者不正確？
- (A) EC describes the manner in which transactions take place over network, mostly the Internet.
  - (B) Business-to-business electronic commerce implies that both the sellers and buyers are business corporations, while business-to-consumer electronic commerce implies that the buyers are individual consumers.
  - (C) Three typical architectural models of electronic marketplaces are supplier-oriented marketplace, buyer-oriented marketplace, and intermediary-oriented marketplace.
  - (D) There are two types of electronic stores: electronic distributors and electronic brokers. If the e-mail takes responsibility for order fulfillment, it is an electronic distributor. In contrast, electronic brokers only help the search process.



## 二、問答題 (60 分)

1. 當你想要在 Windows 作業系統下開發 Web-Based 應用系統時，你會採用何種方式來開發呢？又在 Linux 作業系統下，你會採用何種方式來開發呢？並說明其原因。(10 分)
2. 何謂 UML(Unified Modeling Language)？試問在系統分析與設計上如何使用 UML 呢？(10 分)
3. 何謂對稱金鑰密碼系統(Symmetric Cryptographic Algorithm)及非對稱金鑰密碼系統(Asymmetric Cryptographic Algorithm)？又非對稱金鑰密碼系統如何達到資料加密及數位簽章的功能呢？(10 分)
4. 請以 C 語言寫一程式，這個程式會從 stdin 輸入三個整數，然後會呼叫一個稱為 order 的函數 (function)，呼叫 order 之後會將兩個整數從小到大排序。請利用 order 將三個整數從小到大排序後，輸出至 stdout。order 只有兩個型態是 \*int 的地址參數，在執行後若第一個地址參數中存的值大於第二個地址參數中存的值，則會將兩個地址參數中的值互換。(15 分)
5. 請以 C、Perl、Java 或 Scheme 中的任一語言寫一個程式，這個程式中會定義一個內建之含有以下幾個整數的資料結構：  
3, 4, 9, -5, -2, 7, 11, 25, -9, 14
  - 請寫一函數 (function) 或方法 (method)，將這個資料結構傳入，並傳回這些數字的和。
  - 請寫一函數 (function) 或方法 (method)，將這個資料結構傳入，並傳回這些數字中是負數的個數。
  - 請寫一函數 (function) 或方法 (method)，將這個資料結構傳入，並傳回這些數字的平均。
  - 請寫一主程式，將上面三個函數 (function) 或方法 (method) 的傳回結果輸出至電腦螢幕 (stdout) 上。(15 分)



一、Microeconomics:

**ANSWER THE FOLLOWING QUESTIONS POINTEDLY. EACH QUESTION IS WORTH 5 POINTS.**

1. Many products, such as drugs, are illegal. What do you think would happen to the price of an illegal product if it were legalized?
2. Let income in state 1 be  $Y_1$  and income in state 2 be  $Y_2$ . If both state 1 and state 2 have the probability of  $1/2$ , and  $U(Y_i) = Y_i$ , draw the indifference curves in the state space. Is the agent risk-averse?
3. Let uncertain prospect A be  $(\$100, \$10; 2/5)$ . Where  $(x, y; \pi)$  represents a situation in which  $x$  occurs with probability  $\pi$  and  $y$  occurs with probability  $1-\pi$ . Now define uncertain prospect B as  $(\$100, A; 1/2)$ . What is the probability of winning \$100 in prospect B?
4. Assume that the marginal-utility schedules for goods X and Y are independent and subject to the law of diminishing marginal utility. Can either good X or good Y be an inferior good? Illustrate your answer.
5. Suppose that there are 100 identical people each with the demand curve  
 $Q = 10 - 2P$ . Compute the equilibrium price when supply is fixed at  
 $S = 400$ .
6. Suppose  $MP_K$  is never zero but  $MP_L = 0$  whenever L exceeds or equals K. Draw the isoquant map and the economic region of production.
7. Suppose labor costs \$20 an hour. An extra hour of labor yields 10 brooms. To make 10 brooms, \$30 worth of material is required. What is the marginal cost of a broom?
8. Can perfect competition exist if some managers are smarter than others and achieve lower levels of costs? Why or why not?
9. Assume a monopolist sells a product in two separate markets. The demand curve in market 1 is  $P_1 = 10 - Q_1$  and market 2 is  $P_2 = 20 - Q_2$ . If  $MC = \$2$ , determine the monopolist profit.
10. Suppose a Cournot oligopoly consists of two firms, each of which faces a constant marginal cost of \$1. The market demand curve is  $P = 10 - Q$ . What is the Cournot equilibrium?



## 二、Macroeconomics:

題目共四大題，其中包含十個小題，每一小題分數各為 5 分。

1. 假設一封閉經濟，其經濟可簡單描繪如下：

$$\text{消費函數: } C=200+0.25(Y-T)$$

$$\text{投資函數: } I=150+0.25Y-1000i$$

$$\text{政府購買: } G=250$$

$$\text{定額淨稅賦: } T=200$$

$$\text{貨幣需求: } (M/P)^d=2Y-8000i$$

$$\text{貨幣供給: } M/P=1600$$

其中  $Y$  為實質產出， $i$  為利率。

- 請導出 IS 曲線的斜率
- 請導出 LM 曲線的斜率
- 請求出均衡的實質產出與利率

2. 設某國央行之資產為 3000 元政府公債，負債則為 2600 元的通貨以及 400 元的商銀準備性存款。

- 假定商銀不持有通貨，亦無超額準備，存款準備率為 20%，則該國之貨幣供給量為多少？
- 設商銀不持有任何超額準備，而央行想藉由調整存款準備率以降低貨幣供給量至 4200 元，存款準備率須設定為多少？
- 設商銀不持有任何超額準備，而央行想藉由公開市場操作以降低貨幣供給量至 4000 元，其必須如何操作？

3. 如果電腦和紹興酒在台灣及中國大陸的勞動投入如下所示：

	台灣	大陸
電腦	11 人日	12 人日
紹興酒	3 人日	4 人日

人日為勞動投入單位。

- 台灣及大陸的比較利益為何？
- 若電腦的國際價格為每台 12000 元，而紹興酒價格每瓶 3300 元，則台灣與大陸的工資各為何？



4. 根據新古典成長模型，假設經濟體之生產函數  $Y = K^{1/3} N^{2/3}$ ，且儲蓄率  $s$  和折舊率  $\delta$  均等於 0.10

a. 穩定狀態之平均每位勞工資本及產出水準為何？

設經濟體在  $t$  期已達穩定狀態，在  $t+1$  期後，折舊率增至 0.2

b. 計算在折舊率改變之後，前二期之平均每位勞工資本和平均每位勞工產出的路徑。