國立虎尾科技大學九十五學年度研究所（碩士班）入學試題

考試科目 2 ：作業研究

所別：工業工程與管理研究所

注意事項：(1)本試題共有四大題，合計 100 分。

(2)請務必作答於答案卷中，並將題號標示清楚，否則不予計分。

I.第一大題 (70%) 單選題 (不倒扣，每題 5 %)

The problems 1-3 below refer to the following linear programming (LP).

$$
\begin{aligned}
\text{(LP)} \quad & \text{Max } Z = 3x_1 + 5x_2 \\
& \text{s.t. } x_1 \le 4 \\
& \quad 2x_2 \le 12 \\
& \quad 3x_1 + 2x_2 \le 18 \\
& \quad x_1, x_2 \ge 0
\end{aligned}
$$

_____ 1. Which of the following is an optimal solution for the LP ?

(A) $x_1 = 0,\ x_2 = 0$ (B) $x_1 = 4,\ x_2 = 0$ (C) $x_1 = 4,\ x_2 = 3$ (D) $x_1 = 2,\ x_2 = 6$

(E) none of the above

_____ 2. Which of the following solution is degenerate?

(A) $x_1 = 0,\ x_2 = 0$ (B) $x_1 = 0,\ x_2 = 6$ (C) $x_1 = 4,\ x_2 = 3$ (D) $x_1 = 2,\ x_2 = 6$

(E) none of the above

_____ 3. Suppose that the area for the feasible region of the LP is Q. Which of the following is correct ?

(A) 0<Q≤5 (B) 5<Q≤10 (C) 10<Q≤15 (D) 15<Q≤20 (E) none of the above

Problems 4-6 consider the following transition probability matrix.

$$
P = \begin{array}{c} \text{state} \\ 1 \\ 2 \\ 3 \\ 4 \end{array}
\begin{array}{c}
\begin{array}{cccc} 1 & 2 & 3 & 4 \end{array} \\
\begin{pmatrix}
1 & 0 & 0 & 0 \\
0 & 1 & 0 & 0 \\
0 & 1/4 & 1/2 & 1/4 \\
1/3 & 1/3 & 1/3 & 0
\end{pmatrix}
\end{array}
$$

_____ 4. Which of the following is correct ?

(A) state 1 is transient and state 3 is absorbing.

(B) state 3 is recurrent and state 1 is transient.

(C) state 4 is transient and state 2 is absorbing.

(D) state 2 is recurrent and state 4 is absorbing.

(E) none of the above

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_____ 5. Which of the following is correct ?

(A)If you start at state 3, you expect to visit the state 3 for $\frac{12}{5}$ times and state 4 for $\frac{3}{5}$ times.

(B) If you start at state 3, you expect to visit the state 3 for $\frac{3}{5}$ times and state 4 for $\frac{12}{5}$ times.

(C) If you start at state 4, you expect to visit the state 4 for $\frac{12}{5}$ times and state 4 for $\frac{3}{5}$ times.

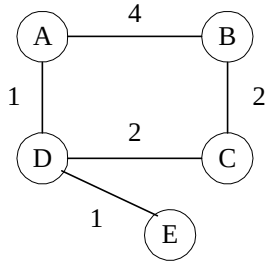
(D) If you start at state 4, you expect to visit the state 4 for $\frac{3}{5}$ times and state 4 for $\frac{12}{5}$ times.

(E) none of the above

_____ 6. Suppose that you start at state 3. What is the probability of being to state 1 ?

(A) $\frac{1}{5}$ (B) $\frac{2}{5}$ (C) $\frac{3}{5}$ (D) $\frac{4}{5}$ (E) none of the above

Problems 7-9 consider the following network with five nodes and N={A,B,C,D,E}.
Let d(x,j) = the shortest distance from node x to node j, where x、$j \in$N.



_____ 7. Which of the following is correct ?

(A) d(A,E)=4 (B) d(B,E)=4 (C) d(A,C)=4 (D) d(B,E)=4

(E) none of the above

_____ 8. Let $\tau(x)=\max_{j\in N} d(x,j)$. Which of the following is correct ?

(A) τ (A)=3 (B) τ (B)=3 (C) τ (C)=3 (D) τ (D)=3

(E) none of the above

_____ 9. (承上題) Assume that the *vertex center* Y of the network is defined as $\tau(Y)=\min_{x\in N} \tau(x)$. Which of the following node is the vertex center Y for the network ?

(A) A (B) B (C) C (D) D (E) none of the above

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_____ 10. If a linear programming problem has a finite optimal solution, then
(A) its feasible set must be bounded
(B) its feasible set could be unbounded
(C) it could have exactly two optimal solutions
(D) the optimal solution must be unique
(E) none of the above

_____ 11. Selecting a forecasting technique for which the largest absolute deviation is minimized is similar to which decision analysis approach?
(A) Maximin.
(B) Minimax.
(C) Minimin
(D) Maximax.
(E) none of the above

_____ 12. Consider the following transition matrices $[p_{ij}]_{4\times4}$ associated with four Markov chains. Note that p_{ij} represents the probability that the process is in state *i* and next makes a transition into state *j*. Which of these Markov chains is irreducible (or regular) ?

(A) $\begin{bmatrix} 0.7 & 0 & 0.3 & 0 \\ 0 & 0.8 & 0 & 0.2 \\ 0.5 & 0 & 0.5 & 0 \\ 0 & 0.6 & 0 & 0.4 \end{bmatrix}$ (B) $\begin{bmatrix} 0.3 & 0.6 & 0.1 & 0 \\ 0 & 0 & 0.5 & 0.5 \\ 0 & 0.2 & 0.5 & 0.3 \\ 0.4 & 0.2 & 0.4 & 0 \end{bmatrix}$ (C) $\begin{bmatrix} 0 & 0.3 & 0.3 & 0.4 \\ 0.2 & 0.1 & 0.3 & 0.4 \\ 0 & 0 & 0.7 & 0.3 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

(D) $\begin{bmatrix} 0 & 0.9 & 0.1 & 0 \\ 0.2 & 0 & 0.8 & 0 \\ 0 & 1 & 0 & 0 \\ 0.5 & 0.2 & 0 & 0.3 \end{bmatrix}$ (E) none of the above

_____ 13. Which of the following complexity of algorithm is NP ?
(A) O(*n*) (B) O(n^2) (C) O(log *n*) (D) O(e^n) (E) none of the above

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_____ 14. Consider the following transportation problem with the tableau below:

Cost (C*ij*)	Dallas	Chicago	Detroit	Denver	supply
Los Angles	85	60	90	120	200
New York	100	120	70	150	405
Atlanta	150	210	170	90	290
demand	250	180	215	250	

Using VAM(Vogel's Approximation Method) to obtain the feasible solution with total transportation cost T. Which of the following is correct ?

(A) 70000<T≤75000 (B) 75000<T≤80000 (C) 80000<T≤85000 (D) 85000<T≤90000
(E) none of the above

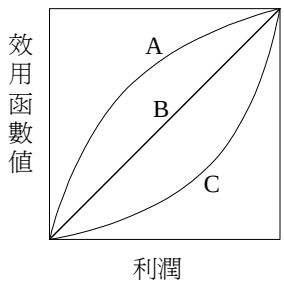
II. 第二大題 (9%)

假設某人現在有以下兩個投資選擇方案：
方案一：35%的機率可得＄40,000，65%的機率什麼都沒有。
方案二：15%的機率可得＄62,500，85%的機率可得＄3,600。

(a) (3%) 若此人對金錢的效用函數是 $U(x)=\sqrt{x}$ ，則他會選擇方案一或方案二？ 爲什麼 ？

(b) (3%) 若此人對金錢的效用函數是 U(x)=2x，則他會選擇方案一或方案二？ 爲什麼 ？

(c) (3%) 下圖有三條效用函數曲線 A、B、C，請問那一條效用曲線爲冒險型投資人較常用 ？ 爲什麼 ？



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III. 第三大題 (15%)

考慮下列線性規劃：

$$\begin{aligned} \text{(Primal)} \quad & \text{Min } Z = 2x_1 + 4x_2 + 5x_3 + 7x_4 \\ & \text{s.t. } 2x_1 + x_2 + 3x_3 + 2x_4 \geq 4 \\ & \quad -2x_1 + x_2 - x_3 + 3x_4 \leq -3 \\ & \quad x_1, x_2, x_3, x_4 \geq 0 \end{aligned}$$

(a) (5%) 建立此原始問題(primal problem)的對偶問題(dual problem)。
(b) (5%) 以圖解法求解對偶問題。
(c) (5%) 利用對偶性質與對偶問題之最佳解，求原始問題之最佳解。

IV. 第四大題 (6%)

列舉三種常用來解線性規劃 (linear programming) 的軟體。