

**朝陽科技大學 97 學年度碩士班招生考試試題**

系(所)別：工業工程與管理系  
 組別：一般生  
 科目：作業研究

總分：100 分

第 1 頁共 2 頁

本試卷共 7 大題，總分 100 分，請詳列計算過程，否則不予計分。

1. (20%) Consider the following linear programming problem

$$\begin{aligned} \max \quad & Z = 2x_1 + 3x_2 \\ \text{s.t.} \quad & -x_1 + x_2 + x_3 = 5 \\ & x_1 + 3x_2 + x_4 = 35 \\ & x_1 + x_5 = 20 \\ & x_1, x_2, x_3, x_4, x_5 \geq 0 \end{aligned}$$

- (a) How many feasible solutions does this problem have? (5%)
- (b) How many basic solutions does this problem have? (5%)
- (c) How many basic feasible solutions does this problem have? (5%)
- (d) What is the optimal solution to this problem? (5%)

2. (20%) Consider the following linear programming problem

$$\begin{aligned} \min \quad & Z = 2x_1 + 15x_2 + 5x_3 + 6x_4 \\ \text{s.t.} \quad & x_1 + 6x_2 + 3x_3 + x_4 \geq 2 \\ & -2x_1 + 5x_2 - x_3 + 3x_4 \leq -3 \\ & x_1, x_2, x_3, x_4 \geq 0 \end{aligned}$$

- (a) Write out the dual to this problem. (5%)
- (b) Solve the dual problem graphically. (5%)
- (c) Use the complementary slackness conditions to obtain the optimal solution to the primal. (10%)

3. (10%) Apply the Hungarian method to solve the assignment problem with the following cost table.

		<i>Task</i>			
		<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
<i>Assignee</i>	<i>A</i>	4	6	5	5
	<i>B</i>	7	4	5	6
	<i>C</i>	4	7	6	4
	<i>D</i>	5	3	4	7

4. (10%) 假設你參加一個簡單的賭博遊戲，每一次贏的機率是  $2/3$ 。每贏一次，可獲得\$100 元；每輸一次，則須付出\$100 元。若輸光或是贏得\$300 的賭金就結束比賽。以馬可夫鏈描述此賭博遊戲時，其轉換機率矩陣為何？假設目前手上有\$200 元，玩此遊戲兩次後，手上有\$0 元、\$100 元的機率分別是多少？

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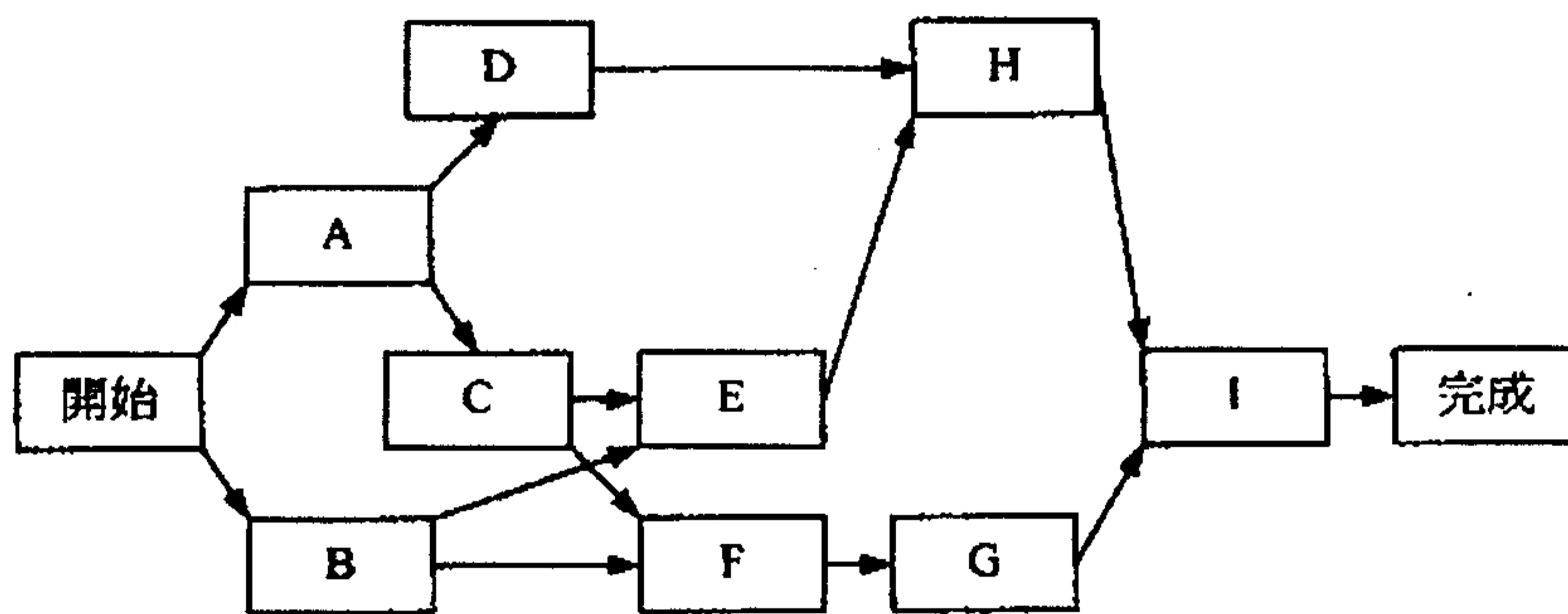
總分：100 分

第 2 頁共 2 頁

5. (15%) Suppose that a queuing system has two servers, an exponential inter-arrival time distribution with a mean of 1/2 hour, and an exponential service-time distribution with a mean of 1/2 hour for each server.

- (a) Develop the balance equations. (3%)
- (b) Calculate the probability of exactly  $n$  customers in queuing system,  $P_n$ . (7%)
- (c) Calculate the expected number of customers in the waiting line,  $L_q$ . (5%)

6. (15%) 漢彌爾頓縣立公園正計畫在新近取得的一百畝土地上開發一個公園及休閒園區。PERT/CPM 網路與各作業所需時間如下。



	A	B	C	D	E	F	G	H	I
作業時間	9	6	6	3	0	3	2	6	3

- (a) 找出網路之要徑作業及非要徑作業之寬鬆時間。(5%)
- (b) 找出專案排程(各作業之最早、最晚開始與完成時間)。(10%)

7. (10%) Given the following one-step transition matrix of a Markov chain:

$$P = \begin{matrix} & \begin{matrix} 1 & 2 & 3 & 4 \end{matrix} \\ \begin{matrix} 1 \\ 2 \\ 3 \\ 4 \end{matrix} & \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0.25 & 0.5 & 0 & 0.25 \\ 0 & 0 & 1 & 0 \\ 0 & 0.4 & 0.6 & 0 \end{bmatrix} \end{matrix}$$

- (a) Draw the state transition diagram.
- (b) Determine the classes of this Markov chain and, for each class, determine whether it is recurrent or transient.