



1. A student is concerned about her car and does not like dents. When she drives to school, she has a choice of parking it on the street in one space, parking it on the street and taking up two spaces, or parking in the lot. If she parks on the street in one space, her car gets dented with a probability of 0.1. If she parks on the street and takes two spaces, the probability of a dent is 0.02 and the probability of a \$15 ticket is 0.3. Parking in a lot costs \$5, but the car will not get dented. If her car gets dented, she can have it repaired, in which case it is out of commission for 1 day and costs her \$50 in fees and cab fares. She can also drive her car dented, but she feels that the resulting loss of value and pride is equivalent to a cost of \$9 per school day. She wishes to determine the optimal policy for where to park and whether to repair the car when dented to minimize her (long-run) expected average cost per school day.
  - a) Formulate this problem as a Markov decision process by identifying the states and decisions and then finding the Cik. (10%)
  - b) Identify all the (stationary deterministic) policies. For each one, find the transition matrix and write an expression for the (long-run) expected average cost per period in terms of the unknown steady-state probabilities. (10%)
2. Suppose that a queueing system has two servers, an exponential interarrival time distribution with a mean of 2 hours, and an exponential service-time distribution with a mean of 2 hours for each server. Furthermore, a customer has just arrived at 12:00 noon. What is the probability that the next arrival will come (a) before 1:00 P.M., (b) after 2:00 P.M.? (10%)
3. An average of 10 cars per hour arrive at a single-server drive-in teller. Assume that the average service time for each customer is 4 minutes, and both interarrival times and service times are exponential. Answer the following questions:
  - a) What is the probability that the teller is idle? (10%)
  - b) What is the average number of cars waiting in line for the teller? (A car that is being served is not considered to be waiting in line.) (10%)



4. An educational and training institution plans to launch a project for a production and distribution training course, which includes 10 tasks, with the relevant data as shown in the table below.

Task	Preceding Task	Time (day)		Cost	
		Normal	Compressed	Normal	Compressed
A	-	5	3	10	18
B	-	7	5	15	20
C	A	4	3	30	45
D	A	3	2	10	15
E	C	4	3	20	30
F	E	5	3	32	48
G	B, D	3	2	10	12
H	G	6	2	15	24
I	F, H	4	3	10	12
J	F	2	2	28	28

- Use the AON (Activity on Node) method to represent this project. (10 %)
  - How many days are required to complete this project? (5 %) What is the critical path? (5 %)
  - Using marginal cost analysis, shorten the project's duration by 2 days. Which tasks should be shortened? (5 %) How much additional cost will be incurred? (5 %)
5. A company must assign four jobs to four workers. The cost of performing each job depends on the workers' skills, as summarized in the cost table below. Notably, Worker 1 is unable to perform Job 3, and Worker 3 cannot perform Job 4. Additionally, a fifth worker becomes available, with respective costs for the four jobs being \$60, \$45, \$30, and \$80. Is it more economical to replace one of the existing workers with this new worker? (20 %)

		Job			
		1	2	3	4
Worker	1	\$50	\$50	-	\$20
	2	\$70	\$40	\$20	\$30
	3	\$90	\$30	\$50	-
	4	\$70	\$20	\$60	\$70



1. S 公司評估新產品製造設備的投資，公司總經理期望無論選擇購買或租賃的方式，皆能實現成本最小化。為此，採購部門整理了 A 至 H 方案的相關數據，如表 1 所示。請運用損益平衡點概念（Break Even Point, BEP）繪製數量-成本分析圖，並根據分析結果提出最佳策略，協助經理做出最適當之決定。（10 分）

表 1.

方案	購買或租賃	固定成本	變動成本
A	購買	48,500	1,000
B	購買	235,000	500
C	購買	50,000	1,000
D	購買	27,500	750
E	購買	250,000	600
F	租賃	0	2,500
G	租賃	3,000	2,550
H	租賃	5,000	800

2. X 公司在產線上配置了 7 種機器類型，依 A、B、C、D、E、F、G 的順序排列，其主要生產品項有 P1 至 P4。然而，各產品 P1 至 P4 的加工程序存在差異，如表 2 所示。考慮產品的生產數量與單位重量，請運用從至圖技術回答以下問題。

表 2.

產品	生產數量	單位重量	加工程序
P1	20	1	A-B-C-E-D-G
P2	100	2	A-C-B-E-D-F-G
P3	50	1	A-C-B-E-D-G
P4	10	1	A-C-D-F-G

- (a) 計算現有產線佈置的所有產品之從至總距離（順向距離 + 逆向距離）。  
說明：相鄰兩機器間的移動步數為 1，跨越一台機器的步數為 2，以此類推；若出現逆向移動，需加倍懲罰值（逆向距離  $\times 2$ ）。（10 分）
- (b) 請提出改善建議，與其改善後的從至總距離為多少？（10 分）
3. 一家新創公司進行新產品的投資，初始固定成本總計為 1,000 萬元。生產該產品每單位成本為 10,000 元。公司設定的目標是期望在 2 年內達到損益平衡，假設每年有 200 個工作日。
- (a) 每日預期銷量為 2 件，產品價格應訂為多少可以實現目標？（5 分）
- (b) 若經過製程改善，單位生產成本降低了 5%，且每日預期銷量提升至 3 件，產品價格應訂為多少可以在 2 年內獲利 100 萬元？（5 分）



國立雲林科技大學 114 學年度  
碩士班招生考試試題

系所：工管系  
科目：生產管理

4. 何謂產品可靠度？產品可靠度常用機率分配包含 Poisson distribution 與 Exponential distribution，試說明其機率密度函數與意義。（10 分）
5. 請陳述追尋需求策略（chase demand）、固定雇用人數與變動工作時數策略、固定產能策略（level capacity）等三種生產策略之優缺點與適用時機。（20 分）
6. 某書店以每本 150 元之價格販售壹周刊，假設該書店每週二早上以每本 90 元之成本進貨，倘若該周刊於一週後無法悉數售出，則可以每本 40 元之代價退回壹周刊本社，該書店依據過去 25 週壹周刊銷售之狀況彙整如表 3。請以最大期望利潤法決定每週應訂購之數量。（15 分）

表 3.

銷售數量	21	22	23	24	25	26	27
發生次數	1	3	4	7	5	3	2

7. 對於一 7 工作單機排程問題（如表 4），若其目標為平均工作延遲（mean job lateness）最小化，則該問題之最佳加工順序應如何安排（請詳細說明你的理由）。（15 分）

表 4.

工作編號	1	2	3	4	5	6	7
作業時間	5	8	3	6	9	4	7
到期日	5	25	7	15	38	10	28