國　立　清　華　大　學　命　題　紙

97 學年度工業工程與工程管理學系（所） 乙、丁 組碩士班入學考試

科目 生產管理 科目代碼 1502、1702 共 3 頁第 1 頁 *請在【答案卷卡】內作答

註：不得使用計算器；滿分 100 分。

1.(25%)下列為一典型的物料需求規畫(MRP)記錄表，請回答：

週		1	2	3	4
毛需求(Gross requirement)		20	20	30	25
預期收貨(Scheduled receipts)		39			
預計庫存(Projected on hand)	5	24	4	14	29
淨需求(Net requirements)				26	11
計劃訂單收貨(Planned-order receipts)				40	40
計劃訂單發放(Planned-order releases)		40	40		

(1a) 試指出此 MRP 記錄表在計算前所必須已知條件為何？

(1b) 毛需求(Gross requirement)及淨需求(Net requirement)的意義及其不同點。

(1c) 說明預計收貨(Scheduled receipts)之意義與量之來源。(Hint:與供應商關係)

(1d) 「計劃訂單發放（planned-order releases）」有何用途?

(1e) 說明「計劃訂單發放（planned-order releases）」與預計收貨(Scheduled receipts) 兩者間，在實務作業上有何關係。

2.(15%)試以下例說明決定安全庫存量與再訂購點(ROP)兩者之關係。

(2a)某汽車修理站每天銷售機油是一隨機需求。假設機油的銷售近似常態分配，每天平均 100 瓶機油，標準差每天 10 瓶。其供應商交貨前置時間為三天。若該汽車修理站要維持 5%缺貨之風險，請問機油再訂購點(ROP)應設為多少？安全庫存量為多少？($z_{0.95}$=1.65)

(2b)試以圖式論述再訂購點與安全庫存量兩者之關連。並說明兩者之意義。

(2c)若供應商交貨前置時間不為固定，你將如何處理?

3.(10%)在現場管制(Shop Floor Control)中有一重要定律"**Little's Law**"，試舉例解釋之。

4. (15%) What is "moving average"? What is "exponential smoothing"? What is the basic difference between these two methods?

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科目　生產管理　科目代碼 1502、1702 共 3 頁第 2 頁 *請在【答案卷卡】內作答

註：不得使用計算器；滿分 100 分。

5. (10%) If a random arrival process is Poisson with arrival rate λ, we have the following two properties:

(i) the time between two consecutive random arrivals is exponential distribution with mean $1/\lambda$.

(ii) The number of customer arrival within a time period with length t is a Poisson random variable with parameter λt.

For example, a Poisson arrival process with average arrival rate of 10 arrivals per day. Then, the time between two arrivals is exponential distribution with mean $1/10$ day. The number of arrivals within 5 days is Poisson random variable with parameter 50 ($=10\times 5$).

Assume the arrivals of customers, who buy a particular TV model, are a random Poisson process. Each arrival customer buys one TV set. The replenishment lead time of the TV model is t (a known constant) and the Poisson customer arrival process has arrival rate of λ (a known constant). With 95% service level, how you determine the re-order point for the inventory control of the TV model?

Note: the probability mass function of a Poisson distribution with parameter α is: $p(i)=\dfrac{e^{-\alpha}\alpha^{i}}{i!}$

6. (10%) Write an LP formulation that determines the earliest start times of the activities of a project scheduling problem. Please use the following notations.

Index:

i, j: activity

Parameters:

d_j: the duration of activity j.

J: the number of activities; that is, i, j=1, 2, …, J.

Set:

P: the set of all precedence constraints. If $(i, j) \in P$, means that activity i has to be finished before activity j can be started.

Decision variables:

S_j: the start time of activity j.

E_j: the end time of activity j.

7. (15%) Confirmed orders are the demands we have promised to delivery previously. New customer demand inquires have lower priority than the confirmed orders. A new customer demand inquire can only be accepted when there is available quantity from production plan after subtracting the confirmed orders. Consider a particular product of the company. Currently, the initial inventory of the product is 60 units. Its confirmed orders and production plan are shown in the following table:

Week	1	2	3	4	5	6	7	8
Confirmed orders	20	30	30	30	40	40	40	50
Production plan	0	0	80	0	80	0	80	0

Answer the following question INDEPENDENTLY.

(7a) If a customer asks for 10 units in week 1, can you promise this order?

(7b) If a customer asks for 20 units in week 2, can you promise this order?

(7c) If a customer asks for 30 units in week 4, can you promise this order?

(7d) What is the maximum quantity that you can promise in week 4?