編號： 262

國立成功大學 105 學年度碩士班招生考試試題

系　　所：工業與資訊管理學系

考試科目：生產與作業管理

考試日期：0228，節次：2

※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. Answer the following problems.
   (1) What is the quality function deployment (QFD)? Construct the house of quality (HOQ), and describe the structure and components of HOQ. (10%)
   (2) What is the Kano model? How to apply this model to QFD for product or service design? (5%)

2. Describe the theory of constraint (TOC). Provide five key principles of TOC. (12%)

3. As a production manager, you have to plan the size of capacity cushion. Please provide 3 and 2 factors leading to large and small capacity cushions, respectively. (10%)

4. A placed assembly line has been devised to manufacture Product Q. The associated data is listed as follows:

Station	Work element assigned	Work element time (min)
S1	A	2.7
S2	D, E	0.6, 0.9
S3	C	3.0
S4	B, F, G	0.7, 0.7, 0.9
S5	H, I, J	0.7, 0.3, 1.2
S6	K	2.4

   (1) What is the maximum hourly output rate from this line? (5%)
   (2) If a worker is at each station and the line operates at this maximum output rate, how much idle time is lost during each 10-hour shift? (5%)
   (3) What is the line's efficiency? (3%)

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5. Background: ExpressAuto distributor is an auto parts supplier to the automobile repair shops in Tainan. ExpressAuto uses its own trucks to deliver the ordered parts to the repair shops with negligible lead time. Because of ExpressAuto's fast service, the repair shops do not store any part, and they order parts from ExpressAuto when they need them. The repair shops are open from Monday to Friday.

   Each Friday evening, ExpressAuto orders additional inventory from its supplier. The supplier delivers early on the coming Monday morning. Consider a particular auto part AQS100. Part AQS100 costs ExpressAuto $175 and ExpressAuto sells it to repair shops for $200. If a repair shop orders part AQS100 and ExpressAuto is out of stock, then the repair shop finds the part from some other distributor. ExpressAuto estimates that each unsold unit of part AQS100 costs $0.50 to hold in inventory at the end of the week and that average weekly demand for part AQS100 follows a Poisson distribution with mean 1.5 units.

   Mathematical functions for this problem: Let $F(S,y)$ denote the probability that a Poisson distribution with a given mean y is S or fewer, and $L(S,y)$ denote the expected amount the outcome of a Poisson distribution with a given mean y exceeds S. Thus, $F(0,1.5) = 0.22313$, $F(1,1.5) = 0.55783$, $F(2,1.5) = 0.80885$, $F(3,1.5) = 0.93436$, $F(4,1.5) = 0.98142$, $F(5,1.5) = 0.99554$, $F(6,1.5) = 0.99907$; $L(0,1.5) = 1.50000$, $L(1,1.5) = 0.72313$, $L(2,1.5) = 0.28096$, $L(3,1.5) = 0.08980$, $L(4,1.5) = 0.02416$, $L(5,1.5) = 0.00558$, $L(6,1.5) = 0.00113$.

   Questions: Suppose it is Friday evening and ExpressAuto currently doesn't have any part AQS100's in stock. Please answer the following questions. (You need to explain how you arrive at the answers.) Precision: five digits after the decimal point.

   (a) (10%) How many part AQS100's should ExpressAuto order from the supplier in order to maximize the expected profit for the upcoming week?
   (b) (8%) If ExpressAuto seeks to achieve a target in-stock probability of 90% for the upcoming week, then how many units of part AQS100 should ExpressAuto order?
   (c) (8%) With the order quantity given in (b), what is ExpressAuto's expected holding cost for the upcoming week?

6. Background: Tainan Power Tools (TPT) is a manufacturer of battery-operated, hand-held power tools for the consumer market. Its two biggest customers (retailers A and B) want

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exclusive products that prevent consumers from making price comparisons. Take power screwdrivers for instance. TPT will sell the same power screwdriver to each retailer, but TPT will use packaging customized to each retailer (including two different product identification numbers). Suppose weekly demand of power screwdrivers to each retailer is normally distributed with mean 4,000 and standard deviation 2,000. TPT makes production decisions on a weekly basis and has a three-week replenishment lead time. Because these two retailers are quite important to TPT, TPT sets a target in-stock probability of 99.9%. Finally, TFT adopts the order-up-to model to manage its inventory. (That is, TFT reviews its inventory level periodically. Orders are placed at regular intervals in order to maintain an inventory position at a predefined base stock level.)

Mathematical functions for this problem: Let $\Phi(z)$ denote the probability that the outcome of a standard normal random variable is z or smaller, and $L(z)$ the standard normal loss function (which is the expected amount a standard normal random variable exceeds z). Thus, $\Phi(2.32) = 0.9898$, $\Phi(2.33) = 0.9901$, $\Phi(3.1) = 0.9990$, $\Phi(3.3) = 0.9995$; $L(2.32) = 0.0035$, $L(2.33) = 0.0034$, $L(3.1) = 0.0003$, $L(3.3) = 0.0001$.

Question: Please answer the following questions. (You need to explain how you arrive at the answers.) Precision: four digits after the decimal point.

(a) (8%) What are the advantages and disadvantages of continuous review systems and periodic review systems?

(b) (10%) Based on the order-up-to model, what is TPT's expected on-hand inventory of the two versions of this power screwdriver?

(c) (6%) The operations manager at TPT suggests that TPT shall stock power screwdrivers without putting them into their specialized packaging. As orders are received from the two retailers, TPT would fulfill those orders from the same stockpile of inventory, since it doesn't take much time to actually package each tool. Suppose demands at the two retailers have a slight negative correlation, –0.155. By how much would this new system reduce TPT's expected on-hand inventory?