國立成功大學

114學年度碩士班招生考試試題

編　號：169

系　所：工業與資訊管理學系

科　目：生產與作業管理

日　期：0211

節　次：第 2 節

注　意：1.可使用計算機
　　　　2.請於答案卷(卡)作答，於試題上作答，不予計分。

1. (25%) Multiple Choice Questions (25 points, 5 points each):

(a) Suppose the variability (as measured by the standard deviation) of demand faced by a newsvendor increases while the average demand remains the same, what happens to the optimal stocking quantity?

A. It will always increase.

B. It will always decrease.

C. It will always remain the same.

D. It cannot be determined.

(b) In a supply chain, the variability of demand is much higher for manufacturers than for retailers. In what ways can upstream and downstream partners work together to address this issue?

A. Share information with each other.

B. Reduce lead time.

C. Stabilize price.

D. All the other answers are correct.

(c) Which of the following is not true about critical path analysis and crashing activities?

A. All activities on the critical path are critical activities.

B. When there are multiple critical paths, you can randomly select an activity from any of the critical paths to crash.

C. Any delay in critical activities delays the end time of the project.

D. Crash time is the minimum possible time to complete the activity as opposed to the normal time.

(d) Suppose in the EOQ model the per unit holding cost H>0, is smaller than the per unit setup cost S>0, and our order size Q is larger than the optimal order quantity Q_{opt} (i.e., Q>Q_{opt}> 0). Then the annual inventory holding cost

A. will be larger than the annual inventory setup cost.

B. will be smaller than the annual inventory setup cost.

C. will be equal to the annual inventory setup cost.

D. may be larger or smaller than the inventory setup cost.

(e) In the news vendor model, what would happen to the safety stock S* if the salvage value of the item strictly increases?

A. S* will increase.

B. S* will decrease.

C. S* will remain the same.

D. S* may increase or decrease.

2. (25%) Consider the process of producing product X. This process consists of four tasks: A, B, C, and D. Task A and task B are in parallel and will be performed first. That is, after a flow unit enters the process, it will go through Task A and B simultaneously. After both task A and task B are completed, the flow unit will be processed by task C and task D sequentially. Task D is the packing stage and there are two identical packing machines available for this stage. Each of the packing machines is able to perform and complete Task D alone, i.e. each flow unit only needs to be processed by one packing machine. The following table shows resources and flow time for each activity.

Activity	Resources	Flow Times
Task A	Worker 1	10 minutes per unit
Task B	Worker 2	12 minutes per unit
Task C	Worker 3	15 minutes per unit
Task D	Two identical packing machines	20 minutes per unit

(a) (10%) Draw the process map (linear flow chart) for the above process.

(b) (5%) What is the capacity rate of this process?

(c) (5%) If this production system produced on average 3 units per hour last year, what was the utilization of the resources for task D?

(d) (5%) If the flow time of task C is cut by half, how will the capacity rate of this process change?

3. (25%) IIM Delicious Restaurant purchases a certain ingredient for $350 per kilogram for cooking, and the ingredients must be used on the same day as they cannot be preserved for future use. Each kilogram of ingredients can produce 5 dishes, which are sold for 160 NTD each. The total cost of labor, overhead, and seasonings amounts to 100 NTD per dish. There may be some ingredient waste during preparation, and IIM Delicious Restaurant has compiled the daily ingredient demand as shown in the table below. Any unused ingredients are sold to recyclers. IIM Delicious Restaurant purchases 25 kilograms of ingredients daily.

Demand (kilogram)	Frequency
≤ 10	0.20
15	0.20
20	0.25
25	0.15
30	0.10
≥ 35	0.10

(The ordering unit is five kilograms.)

(a) (5%) What is the shortage cost of the ingredient per kilogram?

(b) (9%) Assuming that IIM Delicious Restaurant's purchasing decision of the ingredient is optimal, what is the implied range of the price sold to recyclers?

(c) (5%) If the price sold to recyclers increases beyond the result in the previous question, how would it affect the purchasing quantity of IIM Delicious Restaurant? Explain.

(d) (6%) Suppose the price sold to recyclers is 150 NTD, while the price per dish is undetermined. Keep the optimal purchasing quantity at 25 kilograms, and calculate the range of the price per dish.

4. (25%) IIM Manufacturing Company is evaluating a new production line to improve capacity. The production line consists of 10 tasks (A–J), with the "Immediate Predecessors" and "Task Time (seconds)" shown in the table below:

Task	Immediate Predecessor	Task Time (Seconds)
A	–	42
B	A	9
C	B	10
D	–	43
E	D	26
F	E	12
G	C	10
H	C	10
I	F, G, H	12
J	I	8

(a) (5%) Develop the precedence diagram.

(b) (6%) Determine the minimum cycle time, then calculate the cycle time required to produce 600 units in an 8-hour workday.

(c) (10%) Balance the production line using the greatest positional weight heuristic. Break ties using the most following tasks heuristic. Use the required cycle time calculated in (a).

(d) (4%) Calculate the percentage idle time for the production line.