

國立成功大學

115學年度碩士班招生考試試題

編 號：159

系 所：工業與資訊管理學系

科 目：生產與作業管理

日 期：0203

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。

Part I:

1. In recent years, the applications of Artificial Intelligence (AI) have rapidly emerged across various fields. Please provide an example of an AI application suitable for Production and Operations Management (POM), **detailing** the content of the application, the steps for implementation, and relevant precautions or considerations. (10%)
2. The Company ABC is currently planning to relocate its warehouse, which supports its five retail stores. The location and demand for each store are listed below: (20%)

Store	Coordinate (x,y)	Demand
store 1	(1,2)	20
store 2	(8,9)	30
store 3	(6,2)	80
store 4	(4,3)	40
store 5	(7,1)	50

- (a) Use the Center of Gravity Method to determine the **location of the warehouse** that minimizes the transportation cost. (10%)
- (b) Mathematically derive the solution of the Center of Gravity Method using algebra. (10%)
3. The Company DEF currently implements the \bar{x} and R charts (sample size $n = 5$) with 3-sigma control limits. In Phase I, suppose we have $\sum_{i=1}^{30} \bar{x}_i = 3000$ and $\sum_{i=1}^{30} R_i = 300$ after 30 samples were taken. (20%)
 - (a) Find the control limits for the \bar{x} and R charts assuming there are no assignable causes of variation in the system. (10%)
 - (b) In Phase II, the mean of the following 10 samples are: 102, 98, 95, 99, 104, 100, 96, 97, 106, 104. Plot the \bar{x} chart and determine whether the process is in statistical control. (10%)

Sample size n	A_2	D_3	D_4
2	1.880	0	3.267
3	1.023	0	2.575
4	0.729	0	2.282
5	0.577	0	2.115
6	0.483	0	2.004
7	0.419	0.076	1.924
8	0.373	0.136	1.864
9	0.337	0.184	1.816
10	0.308	0.223	1.777

Part II

- II-1. (2%) Which of the following is NOT an input to the aggregate planning process? (a) Resources available (b) Demand forecast (c) Policies on workforce changes (d) Master production schedules (e) Cost information
- II-2. (2%) The portion of projected inventory that enables marketing to make realistic commitments about delivery dates for new orders is called: (a) Available-to-promise inventory. (b) Safety stock inventory. (c) Beginning inventory. (d) High-margin inventory. (e) Master production schedule arrivals.
- II-3. (2%) Scheduled receipts differ from planned receipts in that scheduled receipts: (a) Have longer lead times. (b) Involve orders that have already been placed. (c) Involve orders that have not yet been placed. (d) Involve exceptions to order quantity policies. (e) Have not been pegged with actual customer orders.
- II-4. (2%) In a two-bin inventory system, the amount contained in the second bin is generally equal to the: (a) ROP. (b) EOQ. (c) Amount in the first bin. (d) Optimum stocking level. (e) Safety stock.
- II-5. (2%) In the basic EOQ model, if annual demand doubles, what is the effect on the EOQ? (a) It doubles. (b) It becomes four times its previous amount. (c) It becomes half its previous amount. (d) It increases to about 70 percent of its previous amount. (e) It increases by approximately 40 percent.
- II-6. (2%) Lead time is exactly 20 days. Daily demand is normally distributed with a mean of 10 gallons and a standard deviation of 2 gallons. What is the standard deviation of demand during lead time? (a) 20 multiplied by 2 (b) 20 multiplied by 10 (c) 2 multiplied by the square root of 20 (d) 2 multiplied by the square root of 10 (e) 400 multiplied by the square root of 10
- II-7. (2%) In a single-period model, if the shortage cost is four times the excess cost, the optimum service level is: (a) 100 percent (b) 80 percent (c) 60 percent (d) 40 percent (e) 20 percent
- II-8. (2%) In the Toyota Production System, waste and inefficiency are referred to as _____, while the ongoing effort to reduce them is known as _____. (a) jidoka; heijunka (b) muda; kanban (c) kaizen; heijunka (d) muda; kaizen (e) muda; jidoka
- II-9. (2%) Which of the following is NOT a benefit of small lot sizes in lean systems? (a) In-process inventory is significantly reduced. (b) Each product is produced less frequently. (c) Carrying costs are reduced. (d) There is less clutter in the workplace. (e) Inspection and rework costs are lower.
- II-10. (2%) Attempting to determine the optimal time to perform maintenance activities before a failure occurs is called: (a) Breakdown maintenance. (b) Forecastive maintenance. (c) Predictive maintenance. (d) Preventive maintenance. (e) Corrective maintenance.
- II-11. (2%) Which of the following is NOT a measure of supply chain reliability? (a) Supply chain response time (b) On-time delivery (c) Fill rate (d) Lead time variability (e) Improving e-fulfillment statistics
- II-12. (2%) The priority rule where jobs are processed according to the smallest ratio of time remaining until due date to processing time remaining is: (a) CR. (b) EEDD. (c) FCFS. (d) S/O. (e) SPT.
- II-13. (6%) A firm has 56 units of product X on hand. The demand forecast is 20 units per week. An MPS quantity of 100 units is planned to arrive in period 3. Actual customer orders are as follows: 24 for period 1, 18 for period 2, and 15 for period 3. What is the quantity available for commitment to new customers prior to the receipt of the MPS quantity in week 3?

II-14. (8%) Weekly demand for a particular item averages 30 units, with a standard deviation of 4. This item is managed with a fixed-order-interval model. The order interval is three weeks, and the lead time is one week. The desired service level is 97.5%. It is currently time to place an order, and there are 43 units on hand. How many units should be ordered?

Mathematical functions for this problem: Let $\Phi(z)$ denote the probability that the outcome of a standard normal random variable is z or smaller. Thus, $\Phi(-1.96) = 0.025$, $\Phi(1.28) = 0.9$, $\Phi(1.645) = 0.95$, $\Phi(1.96) = 0.975$, $\Phi(2.24) = 0.9875$.

II-15. (6%) There are four resources and four jobs to be done. Assume there must be one-to-one matching between jobs and resources. The time required for each resource to do each job (in hours) is as follows. For the optimal schedule, what is the total number of hours required to complete these jobs?

Resource	Job (Hours)			
	A	B	C	D
1	5	8	7	7
2	4	9	5	9
3	6	9	8	7
4	7	6	6	9

II-16. (6%) The operations manager of a body and paint shop has five cars to schedule for repair. He would like to minimize the makespan to complete all work on these cars. Each car requires body work prior to painting. The estimates of the times required (in hours) to do the body and paint work on each are as follows. What is the makespan for the optimal schedule?

Car	Body Work	Paint
	(hrs)	(hrs)
A	10	2
B	5	4
C	7	5
D	3	6
E	1	7