

Q2 : (3 marks)

In a two-bin inventory system, the demand for an item during the two-week lead time is normally distributed, with an average of 68 units per week. The standard deviation of weekly demand is 4 units.

- a) What is the safety stock?
- b) What cycle-service level is provided when the normal level in the second bin is set at 145 units?



Q3: (10 marks)

A company needs a demand forecast for the next few years to help decide whether to add new production capacity. The company's sales history is shown in the table below. Use exponential smoothing with trend adjustment to forecast demand. Use 220 for the initial average and an initial trend of 0. The smoothing constants are $\alpha = 0.2$ and $\beta = 0.2$

- Calculate the forecast for period 4
- Calculate the forecast for period 7
- Calculate the mean absolute deviation
- Calculate the mean absolute percent error
- How does the value of α and β affect the forecast?

Period	Actual
1	260
2	320
3	340

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(13 marks)

State if the statement is true or false:

1. A simple moving average of one period will yield identical results to a naive forecast.
2. The EOQ is the smallest lot size that a supplier will allow a customer to order.
3. A bias error results from unpredictable factors that cause the forecast to deviate from actual demand.
4. Combination forecasting is a method of forecasting that selects the best from a group of forecasts generated by simple techniques.
5. Considering the EOQ model, a reduction in ordering costs justifies reducing the lot sizes ordered.
6. Independent-demand items are those items for which demand is influenced by market conditions and is not related to inventory decisions for any other items held in stock.
7. Aggregation is the act of clustering several similar products or services.
8. Market research is a systematic approach to determine consumer interest by gaining consensus from a group of experts while maintaining their anonymity.
9. The dispersion of forecast errors is measured by both MAD and MSE, which behave differently in the way they emphasize errors. MSE gives larger weight to errors and MAD gives smaller weight to errors.
10. Regression equations with a coefficient of determination close to zero are extremely accurate because they have little forecast error.
11. As the service level increases, the probability of not running out of stock during a cycle decreases.
12. When using ABC analysis, class C SKUs should be reviewed frequently.
13. Judgment methods of forecasting should never be used with quantitative forecasting methods.

e)	684.13 ✓
f)	α

Q4 (13 Marks)

1)	T ✓
2)	F ✓
3)	F ✓
4)	F ✓
5)	T ✓
6)	T ✓
7)	T ✓
8)	F ✓
9)	T ✓
10)	F ✓
11)	T α
12)	F ✓
13)	T α

$\frac{11}{13}$

Q3: (10 marks)

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Q5: (5 marks)

A company is conducting an inventory control study of all their items. The following data are for one such item, which is not seasonal.

Month	Sales
January	7
February	9
March	13
April	20

- Use simple linear regression analysis to estimate the relationship between time and sales (state the equation). (Note: Show your solution in details and do not only write the final equation)
- Use the model to forecast sales for May.
- Use the model to forecast sales for July.
- Determine the correlation coefficient.
- Comment on the direction and strength of the relationship between time and sales.

Q4: (8 marks)

A store has collected the following information on one of its products:

Demand = 10230 units/year

Standard deviation of weekly demand = 25 units

Ordering costs = \$30/order

Holding costs = \$4/unit/year

Cycle-service level = 95%

Lead-time = 2 weeks

Number of weeks per year = 50 weeks

- a. If a firm uses the continuous review system to control the inventory, what would be the order quantity and reorder point?
- b. The firm decided to change to the periodic review system to control the item's inventory. For the most recent review, an inventory clerk checked the inventory of this item and found 200 units. There were no scheduled receipts or backorders at the time. How many units should be ordered? (HINT: Use the EOQ model to calculate the time between reviews (P))
- c. What is the total annual cost of the system when using continuous review system and when using periodic review system?

Q5: (10 marks)

A company is conducting an inventory control study of all their items. The following data are for one such item, which is not seasonal.

Month	Sales
January	61
February	65
March	64
April	67
May	60
June	78

- Use simple linear regression analysis to estimate the relationship between time and sales (state the equation). (Note: Show your solution in details and do not only write the final equation)
- Use the model to forecast sales for July.
- Use the model to forecast sales for October.
- Determine the correlation coefficient.
- Comment on the direction and strength of the relationship between time and sales.

A company is conducting an inventory control study of all their items. The company believes that the sales of its main product decreases with increasing the selling price of the product. The following data are for the item: Y (JD), X (units)

Product selling price (JD) (Y)	Sales (X)
25	110
23	125
22	124
20	134

$\sum Y^2 = 61057$
 $(\sum X)^2 = 243049$
 $\frac{9}{10}$

- $\sum X = 493$
 $\sum Y = 90$
 $\sum XY = 11033$
 $\sum X^2 = 2038$
 $(\sum Y)^2 = 90^2 = 8100$
- Use simple linear regression analysis to estimate the relationship between price and sales (state the equation). (Show your solution in details and do not only write the final equation)
 - Determine the correlation coefficient.
 - Comment on the direction and strength of the relationship between price and sales.
 - Can you use the regression equation to forecast the sales?
 - If yes, forecast the sales if the price of the product is 24.

$a) Y = a + bX$
 $b = \frac{\sum XY - n\bar{X}\bar{Y}}{\sum X^2 - n\bar{X}^2}$
 $b = \frac{11033 - (493 \times 22.5)}{2038 - (493^2 / 4)}$
 $b = \frac{11033 - 11092.5}{2038 - 12270.25}$
 $b = \frac{-59.5}{-10232.25} = -0.0058$
 $a = \bar{Y} - b\bar{X}$
 $a = 22.5 - (-0.0058 \times 22.5)$
 $a = 22.623$
 $\therefore Y = 22.623 - 0.0058X$

$b) r = \frac{4 \times 11033 - (493 \times 90)}{\sqrt{(4 \times 2038 - 8100)(4 \times 61057 - 243049)}} = \frac{-238}{24760} = -0.0096$

- The relationship is strong because r is near to (-1).
- Yes.
- $X = 24 \text{ JD} \rightarrow Y = a + bX$
 $= 22.623 - 0.0058 \times 24$
 $= 22.623 - 0.1392$
 $= 22.4838$

Q6: (4 marks)

In a two-bin inventory system, the demand for an item during the two-week lead time is normally distributed, with an average of 68 units per week. The standard deviation of weekly demand is 4 units. What cycle-service level is provided when the normal level in the second bin is set at 145 units?



Q1: (10 marks)

State if the statement is true or false:

1. An intermediate item must have at least one parent and at least one component.
2. An optional replenishment system is a system used to review the inventory position at fixed times intervals and, if the position has dropped to (or below) a predetermined level, to place a variable-sized order to cover expected needs.
3. A bill of materials (BOM) shows all of the components of an item, the parent-component relationships, usage quantities, and lot size derived from engineering and process designs.
4. A stock-keeping unit (SKU) is a specially designed container for holding a specific amount of an inventory item somewhere along the supply chain.
5. The master production schedule (MPS) is the part of the material requirements planning that specifies when components must be ordered or assembled.
6. A continuous review system is sometimes called a reorder point system.
7. Part commonality refers to the degree to which a component has more than one immediate parent.
8. Available-to-promise inventory is the amount of end items that marketing can promise to customers by a certain date.
9. When looking at inventory management, the term "lot size" refers to the physical dimensions of the area where the inventory is stored.
10. The most accurate way to forecast dependent demand is to examine past usage rates.

The University of Jordan
Industrial Engineering Department

Course Title: Production Planning and Control	Final Exam	Student Name:
Semester : Second Semester 2015/2016	Date: 17/5/2016	Registration number:
Course Instructor: Dr. Lana Al-Qatawneh	6 Pages	

Q1: (8 marks)

An end item's demand forecasts for the next 10 weeks are: 40, 40, 40, 40, 30, 30, 30, 30, 40 and 40 units. The current on-hand inventory is 50 units. The order policy is to produce in lots of 80. The booked customer orders for the next 10 weeks are: 15, 42, 10, 45, 3, 0, 10, 0, 0, and 0 units. The lead time is 1 weeks.

a) Develop an MPS for this item.

Lot Size:	Lead Time =	Week									
Quantity on Hand:		1	2	3	4	5	6	7	8	9	10
Forecast											
Customer orders (booked)											
Projected on-hand inventory											
MPS quantity											
MPS Start											
Available To Promise (ATP)											

b) The marketing department has received five orders for this item in the following sequence:

- Order 1 is for 20 units to be delivered in period 1
- Order 2 is for 80 units to be delivered in period 4
- Order 3 is for 90 units to be delivered in period 6
- Order 4 is for 50 units to be delivered in period 7
- Order 5 is for 85 units to be delivered in period 10

Assuming that the prospective MPS you developed in part (a) does not change, which orders would you be able to accept based on the available to promise (ATP)?

Q4: (8 marks)

A store has collected the following information on one of its products:

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- c. What is the total annual cost of the system when using continuous review system and when using periodic review system?

For the data in the table below, use the following two methods of forecasting:

Method 1: calculate the exponentially smoothed forecasts for periods 4 through 6 (using a forecast for period 3 (F_3) of 42 and an alpha of 0.2)

Method 2: calculate the weighted moving average for periods 4 through 6 (using weights of 0.5, 0.3, and 0.2)

Month	Demand
1	40
2	45
3	48
4	43
5	47
6	41

- What is the mean absolute deviation (MAD) for method 1? (for periods 4 through 6)
- What is the mean absolute deviation (MAD) for method 2? (for periods 4 through 6)
- What is the mean absolute percent error (MAPE) for method 1? (for periods 4 through 6)
- What is the mean absolute percent error (MAPE) for method 2? (for periods 4 through 6)
- Which forecasting method would you select? Why?

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Course Title: Production Planning and Control	Final Exam	Student Name:
Semester : First Semester 2017/2018	Date: 10/1/2018	Registration number:
Course Instructor: Dr. Lina Al-Qataweh	5 Pages	

Q1: (10 marks)

The bill of materials and the MPS quantity start date for product A and product Y are shown below. The data from inventory records for items B, C, and D is shown below. Derive an MRP plan for the items B, C, and D.

Item	Lot Rule	Sizing	Lead Time	Scheduled Receipts	Beginning inventory	Safety stock
B	POQ (P=2)		1		0	0
C	L4L		1		50	50
D	FOQ= 1000		2	1000 (week 1)	200	100

MPS Quantity Start Dates								
Product	1	2	3	4	5	6	7	8
A				200			150	80
Y				100	300			

Item: B	Lot Size:							
Description:	Lead Time:							
Week	Safety Stock:							
	1	2	3	4	5	6	7	8
Gross requirements								
Scheduled receipts								
Projected on hand								
Planned receipts								
Planned order releases								

Item: C	Lot Size:							
Description:	Lead Time:							
Week	Safety Stock:							
	1	2	3	4	5	6	7	8
Gross requirements								
Scheduled receipts								
Projected on hand								
Planned receipts								
Planned order releases								

Item: D	Lot Size:							
Description:	Lead Time:							
Week	Safety Stock:							
	1	2	3	4	5	6	7	8
Gross requirements								
Scheduled receipts								
Projected on hand								
Planned receipts								
Planned order releases								

