SET A

Mid Term Exam-IBM 311 (Spring 2025)

- Standard normal table is provided as a separate sheet and will be **collected** at the end of the exam. Do not write/mark anything on this sheet.

- All questions carry 1 mark and has one third negative marking. Unanswered questions will not be marked.

- Right side margin of the question paper can be used for rough work.

1. Which condition makes the POQ model preferable over the EOQ model
(a) No lead time
(b) Random demand fluctuations
(c) High holding costs
(d) Production constraints

c or d

2. What happens if a company underestimates its reorder point?
(a) Faster order processing
(b) Excess inventory
(c) Reduced ordering cost
(d) Increased stockouts

d

3. Regression analysis in forecasting is used to:
(a) Remove seasonality from a dataset
(b) Identify relationships between variables
(c) Detect outliers in data
(d) Randomly generate forecasts

b

4. If the actual demand in the last period was 200 units and the exponential smoothing forecast was 180 units with alpha 0.3, what is the forecast for the next period?
(a) 194
(b) 186
(c) 190
(d) 200

b

5. A tracking signal is used to
(a) Increase the demand for a product
(b) Reduce the need for forecasting
(c) Assign weights in exponential smoothing
(d) Detect bias in forecasts

d

6. Qualitative forecasting methods are generally used when
(a) Only numerical methods are allowed
(b) Data is scarce or unavailable
(c) Historical data is available
(d) Short-term predictions are required

b

7. In the ABC classification method, 'A' items typically represent:
(a) Items with the highest total inventory cost
(b) Low value, high quantity items

d

(c) Medium value, medium quantity items
(d) High value, low quantity items

8. If a company reduces its lead time from 25 days to 9 days, what is the approximate percentage change in safety stock (assuming all other factors remain constant)?
(a) Approximately a 20 percent decrease.
(b) Approximately a 40 percent decrease.
(c) Approximately a 80 percent decrease.
(d) Approximately a 60 percent decrease.

b

9. The "SMILE curve" in value chain analysis suggests that:
(a) All stages of the value chain contribute equally to value creation.
(b) Service activities are always less valuable than product-based activities.
(c) The middle stages of production have lower value compared to upstream and downstream activities.
(d) Manufacturing activities hold the highest value.

c

10. A company has fixed costs of 600,000 and variable costs of 30 per unit. If the selling price per unit is 50, what is the breakeven quantity
(a) 15,000 units
(b) 20,000 units
(c) 10,000 units
(d) 25,000 units

11. A stationary time series:
(a) Has no discernible trend or seasonality
(b) Has a trend but no seasonality
(c) Can be forecasted only using qualitative methods
(d) Contains only seasonal and cyclical variations

a => statistical properties like mean and variance are constant w.r.t. time.

12. The "flow of money" in a typical forward supply chain moves:
(a) Only within individual company departments
(b) In a circular pattern, with no specific direction
(c) Downstream, from suppliers to consumers
(d) Upstream, from consumers to suppliers

d

13. If an item falls under category 'C' in the ABC classification, it is typically:
(a) A perishable good
(b) A high-value item
(c) An obsolete item
(d) A low-value, high-volume item

d

14. In a quality control process, if the mean weight of a product is 250g with a standard deviation of 10g, what weight represents the top 5 percent of the distribution?
(a) 266.45g
(b) 272.15g
(c) 268.75g
(d) 270.80g

a

15. In the context of supply chain relationships, "tight coupling" implies:
(a) Highly flexible and adaptable partnerships.
(b) Diversified supplier networks.
(c) Minimal information sharing and collaboration.
(d) Strong interdependence and synchronized operations.

d

16. Vertical integration primarily aims to:
(a) Gain control over multiple stages of the supply chain
(b) Minimize inventory holding costs
(c) Reduce the number of suppliers
(d) Increase outsourcing activities

a

17. If a company offers a quantity discount, what impact does it have on EOQ?
(a) Depends on the discount structure
(b) Decreases EOQ
(c) Increases EOQ
(d) EOQ remains unchanged

d

18. A renewable energy project has an upfront cost of 2 million and generates annual revenue of 400,000. What is the simple payback period?
(a) 3 years
(b) 7 years
(c) 5 years
(d) 9 years

c

19. The production quantity model differs from the EOQ model in that:
(a) The EOQ model assumes infinite production rate
(b) Orders are received instantly in the production model
(c) The production model does not consider holding costs
(d) Inventory is replenished gradually in the production model

a or d

20. If IQ scores are normally distributed with mean 100 and standard deviation 15, what is the probability that a randomly selected person has an IQ between 85 and 130?
(a) 0.8849
(b) 0.6826
(c) 0.7745
(d) 0.8186

d

21. In the EOQ model, if the ordering cost increases while holding cost remains constant, the EOQ will:
(a) Remains the same
(b) Unpredictable
(c) Decrease
(d) Increase

d

22. Natural resources such as forests, minerals, and rivers are classified under which factor of production?
(a) Labor
(b) Land
(c) Capital
(d) Entrepreneurship

b

23. If the actual sales were 500, 600, and 700 over three months and the forecasted sales were 480, 620, and 690, what is the Mean Absolute Deviation MAD?
(a) 19
(b) 13
(c) 15
(d) 17

d

24. Who is considered the fourth factor of production, responsible for organizing and managing the other three factors?

c

(a) Investor
(b) Landowner
(c) Entrepreneur
(d) Labor

25. Which of the following represents the primary objective of aggregate production planning?
(a) Maximizing production efficiency
(b) Minimizing workforce turnover
(c) Minimizing total production costs
(d) Maximizing customer satisfaction

c

26. If a company reduces its fixed costs, what happens to the breakeven point?
(a) increases
(b) decreases
(c) depends on variable costs
(d) remains the same

b

27. Given demand data for the last four periods: 50, 55, 60, and 65 units, what is the 4-period moving average forecast for the next period?
(a) 57
(b) 56.5
(c) 57.5
(d) 58

c

28. If the heights of a population are normally distributed with mean 170 cm and standard deviation 6 cm, what is the probability that a randomly selected individual has a height between 162 cm and 178 cm?
(a) 0.9973
(b) 0.6826
(c) 0.9544
(d) 0.8413

0.81648 => this was bonus!!

29. In exponential smoothing, the smoothing constant alpha determines:
(a) The level of seasonal variation
(b) The total number of observations used
(c) The weight given to the most recent observation
(d) The trend component of demand

c

30. If the demand for the last three periods was 30 (most recent), 40, and 50 units, and the company uses a weighted moving average (weights: 0.5 for most recent, 0.3 for second, 0.2 for third period), what is the forecast for the next period?
(a) 35
(b) 38
(c) 36
(d) 37

d

31. A company applies exponential smoothing with alpha 0.2. If the forecasted demand for last month was 500 units, and the actual demand was 550 units, what is the revised forecast for the current month?
(a) 540
(b) 510
(c) 530
(d) 520

b

32. A company has a lead time of 16 days and a standard deviation of daily demand of 4 units.

20.48 => this was bonus!!

If they want to achieve a service level of 90 percent, what is the safety stock?
(a) 15 units
(b) 16.4 units
(c) 16 units
(d) 15.8 units

33. A company follows an EOQ policy, but a supplier offers a 5% discount for ordering twice the EOQ. What should the company do?
(a) Always order at EOQ
(b) Accept the discount if total cost decreases
(c) Decrease order size
(d) Increase order quantity even if costs rise

b

34. Which factor significantly contributes to a nation's risk of falling into the "middle-income trap"?
(a) Strong intellectual property protection.
(b) High levels of technological innovation
(c) Low investment in human capital.
(d) Diversified export markets.

c

35. The simple moving average method is best suited for forecasting when
(a) There is no significant trend or seasonality
(b) There is a strong trend in the data
(c) Data is highly erratic
(d) Seasonal variations are present

a

36. A company uses a Holt-Winters method for forecasting. What is its primary advantage over simple exponential smoothing?
(a) It removes bias from forecasts
(b) It uses fewer historical data points
(c) It accounts for trends and seasonality
(d) It works best for short-term forecasts

c

37. If demand is stable but lead time varies, how should the reorder point be adjusted?
(a) Eliminate safety stock
(b) Increase demand rate
(c) Increase safety stock
(d) Reduce EOQ

c

38. A company has an average daily demand of 14 units with a standard deviation of 5, and a lead time of 8 days. If a service level of 90% is desired, then the company's reorder point for this component is approximately?
(a) 125
(b) 120
(c) 135
(d) 130

d

39. Which of the following describes a "networked" supply chain structure?
(a) Linear, sequential flow of materials.
(b) Centralized control with a single dominant player.
(c) Multiple interconnected nodes with collaborative relationships.
(d) Complete vertical integration.

c

40. Lead time is defined as:
(a) The time between forecasting and planning

b

(b) The time between placing an order and receiving it
(c) The time between production starts and finishes
(d) The time between sales and delivery

41. Which of the following variables can be adjusted in the short term to manage production capacity?
(a) Equipment Purchase
(b) Capital Investment
(c) Overtime
(d) Factory Expansion

c

Paragraph 1

A manufacturing company tracks monthly demand for a product over the last five months:

Month 1: 120 units
Month 2: 135 units
Month 3: 150 units
Month 4: 165 units
Month 5: 180 units

The company uses different forecasting methods, including 3-month simple moving average and exponential smoothing with $\alpha = 0.2$, to estimate future demand.

42. What is the 3-month moving average forecast for Month 6?
    a) 150
    b) 160
    c) 165
    d) 170

c

43. If the exponential smoothing forecast for Month 5 was 160 units, what is the forecast for Month 6 using $\alpha = 0.2$?
    a) 164
    b) 166
    c) 168
    d) 170

a

44. If the company prefers weighted moving average forecasting with weights 0.5 for the most recent month, 0.3 for the second most recent, and 0.2 for the third most recent, what is the forecast for Month 6?
    a) 162
    b) 167
    c) 170
    d) 175

c

45. If the actual demand for Month 6 turns out to be 185 units, what is the absolute error for the exponential smoothing forecast from Question 2?
    a) 17
    b) 19
    c) 21
    d) 23

c

46. What is the MAD using exponential forecasting with alpha 0.2, and forecast for first month as 110?
    a) 29
    b) 31
    c) 33
    d) 35

b => forecast for first period is given in question in exponential smoothing. and hence, it has to be counted in error calculation also.

Paragraph 2

A small company, 'QuickFix Parts', sells a standard bolt. The annual demand for these bolts is 4,000 units. The company incurs an ordering cost of $20 per order and a holding cost of $4 per unit per year. The production rate for these bolts, if manufactured in-house, is 100 units per day, and the company operates 200 days per year. The lead time for replenishment is 4 days. The standard deviation of daily demand is 5 units, and QuickFix Parts desires a 95% service level

47. Calculate the reorder point without accounting for safety stock.
    a) 60
    b) 70
    c) 80
    d) 90

c

48. Calculate the Economic Order Quantity (EOQ) for the electronic component.
    a) 150
    b) 200
    c) 250
    d) 300

b

49. If the company decides to manufacture the component instead of ordering it from an external supplier, calculate the Production Order Quantity (POQ).
    a) 220
    b) 224
    c) 228
    d) 232

b => Production Order Quantity model is different from Periodic Order Quantity

50. Calculate the safety stock.
    a) 14
    b) 16
    c) 18
    d) 20

b

51. Calculate the reorder point for replenishment, considering the safety stock.
    a) 90
    b) 97
    c) 105
    d) 110

b

Paragraph 3

A toy company, 'PlayTime Toys', sells a popular board game. They have collected quarterly sales data (in thousands of units) for the past two years, which shows both a trend and seasonal variation. The data is as follows:

	Quarter			
Year	1	2	3	4
2002	50	70	60	55
2003	55	75	65	60
2004	60	85	80	75

PlayTime Toys wants to forecast sales for Year 3, incorporating both trend and seasonality.

52. Calculate the forecast for 2005, using simple linear regression.
    a) 320
    b) 325
    c) 328
    d) 331

53. Calculate the seasonal factor for Quarter 1 (Q1).
    a) 0.18
    b) 0.2
    c) 0.25
    d) 0.3

54. What is the value of 'm' (slope)?
    a) 30
    b) 32.5
    c) 35
    d) 37.5

55. Calculate the demand for Quarter 3 in 2005.
    a) 75
    b) 85
    c) 95
    d) 100

Paragraph 4

A company manufactures electric scooters and forecasts monthly demand to manage inventory efficiently. Over the past six months, the actual demand and forecasted values were as follows:

Month	Actual Demand	Forecasted Demand
Jan	500	~~520~~ 490
Feb	480	~~500~~ 460
Mar	510	490
Apr	530	520
May	490	510
Jun	520	500

56. What is the Mean Absolute Deviation (MAD) for the given data?
    a) 10.67
    b) 16.67
    c) 15.67
    d) 12.67

b

57. What is the cumulative forecast errors over the six months?
    a) 60
    b) 70
    c) 80
    d) 90

a

58. What is the tracking signal (TS) based on the given data for the month of June?
    a) 3
    b) 3.75
    c) 4.25
    d) 4.7

b

59. After which month, the forecast goes out of control? (using control limits of ± 3 MAD)
    a) March
    b) April
    c) May
    d) June

a or b

60. What is the MAPE for the month of April?
    a) 1.2%
    b) 1.5%
    c) 1.8%
    d) 2.1%

c => count only for april => ((10/530) * 100)