

- iii. From the following data of the marks obtained by students, 5 compute rank correlation coefficient:

Marks in Mathematics	Marks in Chemistry
15	40
20	30
28	50
12	30
40	20
60	10
20	30
80	60

Q.5

**Attempt any two:**

- i. Explain Qualitative and Quantitative forecasting with example. **5**
  - ii. Explain what is the method to ensure that chosen forecasting techniques align with company's business goal and objectives. **5**
  - iii. Write advantages and disadvantages of forecasting. **5**

**Q.6**

**Attempt any two:**

- i. Define Forecasting. Explain any four method for Forecasting. **5**

ii. Find the equation of trend line to the following data by least square method: **5**

Years	2001	2002	2003	2004	2005
Value	8	5	12	10	16

iii. Calculate 3 yearly moving average of the data given below:

Year	Sales ('000 Rs.)	Year	Sales ('000 Rs.)
2002	40	2009	105
2003	45	2010	100
2004	55	2011	110
2005	50	2012	140
2006	60	2013	145
2007	90	2014	155
2008	95		

\* \* \* \*

*Total No. of Questions: 6*

*Total No. of Printed Pages:4*

**Enrollment No.....**



## Faculty of Management Studies

End Sem Examination Dec-2023

MS5CO30 Business Statistics & Analytics

Programme: MBA

Branch/Specialisation: Management / Business Analytics

Duration: 3 Hrs.

Maximum Marks: 60

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

- Q.1 i. The first hand and unorganized form of data is called \_\_\_\_\_. 1  
 (a) Secondary Data (b) Organized data  
 (c) Primary Data (d) None of these

ii. The median of the data 7, 6, 4, 8, 2, 5, 11 is: 1  
 (a) 6 (b) 12 (c) 11 (d) 4

iii. The class interval of the type 10-14, 15-19, 20-24, 25-29, 30-34 represents: 1  
 (a) Inclusive type (b) Exclusive type  
 (c) Both (a) and (b) (d) None of these

iv. For Quartile deviation the coefficient of dispersion is defined by- 1  
 (a)  $Q_3 - Q_1 / Q_3 + Q_1$  (b)  $Q_3 - Q_1$   
 (c)  $Q_3 + Q_1 / Q_3 - Q_1$  (d) None of these

v. Relationship between Correlation coefficient and Regression coefficients is- 1  
 (a)  $r = \sqrt{b_{xy}}$   
 (b)  $r = b_{xy} \cdot b_{yx}$   
 (c)  $r = \pm \sqrt{b_{xy} \cdot b_{yx}}$   
 (d) None of these

vi. As per method of least square required equation for fitting of parabola is- 1  
 (a)  $y = a$  (b)  $y = ax + bx$   
 (c)  $y = a + bx$  (d) None of these

[2]

- vii. A qualitative forecast-

  - Predicts the quality of a new product.
  - Predicts the direction, but not the magnitude, of change in a variable.
  - Is a forecast that is classified on a numerical scale from 1 (poor quality) to 10 (perfect quality).
  - Is a forecast that is based on econometric methods.

viii. A \_\_\_\_\_ forecast typically encompass a period of one or two years.

  - Long range
  - Short term
  - Both (a) and (b)
  - None of these

ix. Time Series is used to -

  - Forecast future trend
  - Studying of past behaviour
  - Policy planning
  - All of these

x. While the method uses equal weights for each observation, \_\_\_\_\_ method assigns different weights to each observation to reflect more recent fluctuations in the data and seasonal effects.

  - Weighted moving average
  - Simple average
  - Mean
  - None of these

Attempt any two:

  - Define:
    - Uni-variate data
    - Bi-variate data
    - Multi-variate data
    - Raw data
    - Quantitative data
  - What is the relation between Mean, Mode and Median. Explain limitations of Mean, Mode and Median.
  - The details of runs gained by two batsmen *A* and *B* in different innings are as follows:

1

[3]

<i>A</i>	<i>B</i>
24	5
79	18
31	42
114	53
14	9
2	47
68	52
1	17
110	81
7	56

Which of the two players is better run scorer?

- Q.3** i. Calculate Quartile Deviation from the following distribution:

X	60	62	64	66	68	70	72
F	12	16	18	20	15	13	9

ii. Find the mean deviation from the arithmetic mean of the following distribution.

Marks	No. of students
0-10	5
10-20	8
20-30	15
30-40	16
40-50	6

**OR** iii. Write any 5 qualities of good measure of dispersion explain them briefly.

**Q.4** Attempt any two:

i. The following table shows sales of a company.  
Fit a straight-line trend  $y = a + bx$

Year	2011	2012	2013	2014	2015
Sales	150	165	180	200	220

Find out the trend value for the year 2016.

ii. Write any 5 differences between corelation and regression.

X	60	62	64	66	68	70	72
F	12	16	18	20	15	13	9

Marks	No. of students
0-10	5
10-20	8
20-30	15
30-40	16
40-50	6

Total No. of Questions: 6		Total No. of Printed Pages: 2
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Faculty of Management Studies End Sem Examination Dec-2023 Business Statistics & Analytics (T) - MS5CO30 (T)		
Programme: MBA		Branch/Specialisation:
Duration: 3 Hrs.		Maximum Marks: 60

## Scheme of Marking

Q.1	i)	The first hand and unorganized form of data is called _____. (a) Secondary Data                          (b) Organized data <b>(c) Primary Data</b> (d) None of these	1
	ii)	The median of the data 7, 6, 4, 8, 2, 5, 11 is: <b>(a) 6</b> (b) 12 (c) 11    (d) 4	1
	iii)	The class interval of the type 10-14, 15-19, 20-24, 25-29, 30-34 represents: <b>(a) Inclusive type</b> (b) Exclusive type (c) Both (a) and (b)                        (d) None of these	1
	iv)	For Quartile deviation the coefficient of dispersion is defined by- <b>(a) <math>Q_3 - Q_1/Q_3 + Q_1</math></b> (b) $Q_3 - Q_1$ (c) $Q_3 + Q_1/Q_3 - Q_1$ (d) None of these	1
	v)	Relationship between Correlation coefficient and Regression coefficients is - (a) $r = \sqrt{b_{xy}}$ (b) $r = b_{xy} \cdot b_{yx}$ <b>(c) <math>r = \sqrt{b_{xy} \cdot b_{yx}}</math></b> (d) None of these	1
	vi)	As per method of least square required equation for fitting of parabola is - (a) $y = a$ (b) $y = ax + bx$ <b>(c) <math>y = a + bx</math></b> (d) None of these	1
	vii)	A qualitative forecast - (a) Predicts the quality of a new product. <b>(b) Predicts the direction, but not the magnitude, of change in a variable.</b> (c) Is a forecast that is classified on a numerical scale from 1 (poor quality) to 10 (perfect quality). (d) Is a forecast that is based on econometric methods.	1

	viii)	A _____ forecast typically encompass a period of one or two years. <b>(a) Long range</b> (b) Short term (c) Both (a) and (b)                            (d) None of these	1
	ix)	Time Series is used to - (a) Forecast future trend                        (b) Studying of past behaviour (c) Policy planning <b>(d) All of these</b>	1
	x)	While the method uses equal weights for each observation, _____ method assigns different weights to each observation to reflect more recent fluctuations in the data and seasonal effects. <b>(a) Weighted moving average</b> (b) Simple average (c) Mean    (d) None of these	1
<b>Q.2</b>			<b>Attempt any two:</b>
	i.	Define: (a) Uni-variate data                            (b) Bi-variate data                                    (c) Multi-variate data (d) Raw data                                      (e) Quantitative data <b>1 MARKS X 5 = 5 Marks</b>	5
<b>Answers:</b>			
(a) <b>Uni-variate data:</b> Refers to data that involves observations or measurements on a single variable. It focuses on a single characteristic or attribute, allowing for a straightforward analysis of that specific aspect of the data.			
(b) <b>Bi-variate data:</b> Involves data on two variables, where each value of one variable is paired with a value of another. The relationship or correlation between these two variables is often analyzed.			
(c) <b>Multi-variate data:</b> Encompasses data with more than two dependent variables, resulting in a single outcome. This type of data analysis involves studying relationships among multiple variables simultaneously.			
(d) <b>Raw data:</b> Represents unprocessed and unorganized information collected directly from sources. It is the initial data before any analysis or manipulation.			
(e) <b>Quantitative data:</b> Involves numerical values that can be measured and counted. It is suitable for statistical analysis and allows for precise measurement and comparison			

[2]

- ii. What is the relation between Mean, Mode and Median. Explain limitations of Mean, Mode and Median.

$$2 \times 2 = 5 \text{ Marks}$$

The relationship between Mean, Median, and Mode is often expressed through various formulas. One common relation is:

$$3 \times \text{Median} = \text{Mode} + 2 \times \text{Mean}$$

#### Limitations of Mean, Mode, and Median:

##### Mean:

Sensitive to Outliers: Mean is highly affected by extreme values, making it less robust when outliers are present.

Skewed Distributions: In skewed distributions, the mean may not accurately represent the central tendency.

##### Median:

Ignores Magnitude: Median only considers the order of values, not their magnitude, which can overlook important information.

Limited Measure: Median doesn't provide information about the shape of the distribution.

##### Mode:

Uniqueness: Some datasets may lack a mode or have multiple modes, making it an unreliable measure in such cases.

Not Suitable for Continuous Data: Mode is often not applicable for continuous data.

- OR iii. The details of runs gained by two batsmen A and B in different innings are as follows:

A	B
24	5
79	18
31	42
114	53
14	9
2	47
68	52
1	17
110	81
7	56

$$\Sigma A = 450 \quad \Sigma B = 380$$

Which of the two players is better run scorer?

$$\text{Mean} \rightarrow 2 \times 2 = 4 \text{ Marks}$$

[3]

Batsman A

Batsman B

$$\text{Total No. of innings, } N = 10$$

$$\text{Total No. of innings, } N = 10$$

$$\text{Mean} = \bar{X}_A = \frac{450}{10} = 45$$

$$\bar{X}_B = \frac{380}{10} = 38$$

The mean score of Batsman A is greater than Batsman B.

Hence, Batsman A is a better run scorer.

— 1 Marks

- Q.3 i. Calculate Quartile Deviation from the following distribution:

X	F
60	12
62	16
64	18
66	20
68	15
70	13
72	9

Answer:

$$N = 103$$

$$Q1 = \text{size of } (N/4)^{\text{th}} \text{ item therefore, } 103/4 = 26\text{th item} = 62 \quad - 1 \text{ Mark}$$

$$Q3 = \text{size of } (3N/4)^{\text{th}} \text{ item} = (3 \times 103)/4 = 78\text{th item} = 68 \quad - 1 \text{ Mark}$$

$$\text{Quartile deviation} = Q3 - Q1/2 = 68 - 62/2 = 3 \quad - 2 \text{ Marks}$$

The answer is 3

[2]

ii.	Find the mean deviation from the arithmetic mean of the following distribution.	<b>6</b>																																															
	<table border="1"> <thead> <tr> <th>Marks</th> <th>No. of students</th> </tr> </thead> <tbody> <tr> <td>0-10</td> <td>5</td> </tr> <tr> <td>10-20</td> <td>8</td> </tr> <tr> <td>20-30</td> <td>15</td> </tr> <tr> <td>30-40</td> <td>16</td> </tr> <tr> <td>40-50</td> <td>6</td> </tr> </tbody> </table> <p>Q3(iii) Marks Students Mid-Point of X <math>(X-25)/10</math> fd — 2 Marks</p> <table border="1"> <thead> <tr> <th>(X)</th> <th>(f)</th> <th>Mid-Point of X</th> <th><math>(X-25)/10</math></th> <th>fd</th> </tr> </thead> <tbody> <tr> <td>0-10</td> <td>5</td> <td>5.5</td> <td>-2.5</td> <td>-10</td> </tr> <tr> <td>10-20</td> <td>8</td> <td>15.5</td> <td>-4.5</td> <td>-8</td> </tr> <tr> <td>20-30</td> <td>15</td> <td>25.5</td> <td>-10.5</td> <td>0</td> </tr> <tr> <td>30-40</td> <td>16</td> <td>35.5</td> <td>-14.5</td> <td>16</td> </tr> <tr> <td>40-50</td> <td>6</td> <td>45.5</td> <td>-24.5</td> <td>24</td> </tr> <tr> <td><math>\Sigma f = 50</math></td> <td></td> <td><math>\Sigma fd = 10</math></td> <td></td> <td></td> </tr> </tbody> </table> <p><math>\bar{X} = A + \frac{\sum fd}{N}</math> — 2 Marks</p> $= 25 + \frac{10}{50} \times 10 = 27$ <p>M.D. = <math>\frac{\sum  (x - \bar{x}) }{N}</math> — 2 Marks</p> $\text{SD} = \sqrt{\frac{\sum (x - \bar{x})^2}{N}}$ $= \sqrt{\frac{4725}{50}} = 9.44$ <p>Thus the average marks = 27 and the average deviation of marks is 9.44.</p>	Marks	No. of students	0-10	5	10-20	8	20-30	15	30-40	16	40-50	6	(X)	(f)	Mid-Point of X	$(X-25)/10$	fd	0-10	5	5.5	-2.5	-10	10-20	8	15.5	-4.5	-8	20-30	15	25.5	-10.5	0	30-40	16	35.5	-14.5	16	40-50	6	45.5	-24.5	24	$\Sigma f = 50$		$\Sigma fd = 10$			
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[3]

OR	iii.	Write any 5 qualities of good measure of dispersion explain them briefly. $1 \cdot 2 \times 5 = 6$ Marks	<b>6</b>												
		<b>Answer</b>													
		<ol style="list-style-type: none"> <li><b>Reflects Spread:</b> A good measure of dispersion accurately reflects the spread or variability of data points around the central tendency, providing insights into the data's distribution.</li> <li><b>Based on All Observations:</b> It should consider all individual observations in the dataset, preventing distortion caused by selective inclusion and ensuring a comprehensive evaluation of variability.</li> <li><b>Simple and Understandable:</b> The measure should be easy to calculate and simple to understand, facilitating its application in various contexts and making it accessible to a wide audience.</li> <li><b>Not Sensitive to Outliers:</b> A robust measure of dispersion is not unduly influenced by extreme values or outliers. It should provide a stable representation of variability even in the presence of extreme data points.</li> <li><b>Comparability:</b> A good measure allows for meaningful comparisons between different datasets. It should enable analysts to compare the dispersion of data across various groups or populations effectively.</li> </ol>													
Q.4		<b>Attempt any two:</b>													
	i.	The following table shows sales of a company. Fit a straight-line trend $y = a + bx$	<b>5</b>												
		<table border="1"> <thead> <tr> <th>Year</th> <th>Sales</th> </tr> </thead> <tbody> <tr> <td>2011</td> <td>150</td> </tr> <tr> <td>2012</td> <td>165</td> </tr> <tr> <td>2013</td> <td>180</td> </tr> <tr> <td>2014</td> <td>200</td> </tr> <tr> <td>2015</td> <td>220</td> </tr> </tbody> </table>	Year	Sales	2011	150	2012	165	2013	180	2014	200	2015	220	
Year	Sales														
2011	150														
2012	165														
2013	180														
2014	200														
2015	220														
		Find out the trend value for the year 2016.													

[2]

Q4(i)		Yearly Sales(Y) from Wally Yards				(Y) Trend Values
	Year	Sales(Y)	Deviation (X)	X.Y	$X^2$	
1.	2011	150	-2	-300	4	148
2.	2012	165	-1	-165	1	165.5
3.	2013	180	0	0	0	183
4.	2014	200	1	200	1	200.5
5.	2015	220	2	440	4	218
		$N=5$	$\sum Y = 915$	$\sum X = 0$	$\sum XY = 175$	$\sum X^2 = 10$

The Equation of the straight line is:  

$$Y = a + bX \Rightarrow a = 183, b = 17.5$$

Since,  $\sum X = 0$

$a = \frac{\sum Y}{N} = \frac{915}{5} = 183$  — 1 Marks

$b = \frac{\sum XY}{\sum X^2} = \frac{175}{10} = 17.5$  — 1 Marks

Hence, the Equation of the straight line trend is:  

$$Y = 183 + 17.5X$$

for,  $X = -2$ ,  $Y = 183 + 17.5(-2) = 148$

$X = -1$ ,  $Y = 183 + 17.5(-1) = 165.5$

for the Year 2016 the sales will be 235.5. — 1 Marks

2 Marks

[3]

**2. Purpose:**

- **Correlation:** It assesses the strength and direction of the association between variables.
- **Regression:** It predicts the value of the dependent variable based on the values of independent variables.

**3. Output:**

- **Correlation:** It produces a correlation coefficient, usually denoted by 'r.'
- **Regression:** It results in an equation of the form  $Y=a+bX$ , where 'a' is the intercept, 'b' is the slope, and 'X' is the independent variable.

**4. Causation:**

- **Correlation:** Correlation does not imply causation; it only indicates a relationship.
- **Regression:** Regression can suggest a causal relationship, as it examines the impact of one variable on another.

**5. Mathematical Representation:**

- **Correlation:** It is represented by the correlation coefficient, which ranges from -1 to +1.
- **Regression:** It is represented by the regression equation, which provides specific coefficients for the intercept and slope.

OR      iii. From the following data of the marks obtained by students, compute rank correlation coefficient: 5

Marks in Mathematics	Marks in Chemistry
15	40
20	30
28	50
12	30
40	20
60	10
20	30
80	60

ii. Write any 5 differences between corelation and regression.

5

**Answer****1x5 = 5 Marks****1. Definition:**

- **Correlation:** Correlation measures the degree and direction of a linear relationship between two variables without assuming causation.
- **Regression:** Regression analyzes the impact of one or more independent variables on a dependent variable and provides a predictive model.

[2]

## Answer

Marks in Mathematics	R <sub>M</sub>	Marks in Chemistry	R <sub>C</sub>	(R <sub>M</sub> - R <sub>C</sub> ) <sup>2</sup>
15	2	40	6	16
20	3.5	30	4	0.25
28	5	50	7	4
12	1	30	4	9
40	6	20	2	16
60	7	10	1	36
20	3.5	30	4	0.25
80	8	60	8	0
				D <sup>2</sup> = 81.5

→ 2 Marks

$$R = \frac{6}{N^3} \left\{ \sum D^2 + \frac{1}{12} (m_1^3 - m_1) + \frac{1}{12} (m_2^3 - m_2) \right\}$$

→ 1 Marks

$$N^3 = N$$

The item 20 is repeated 2 times in series X and hence  $m_1 = 2$ .

In series Y, the item 30 occurs 3 times and hence  $m_2 = 3$ .

Substituting these values in the above formula:

$$R = \frac{6}{8^3} \left\{ 81.5 + \frac{1}{12} (2^3 - 2) + \frac{1}{12} (3^3 - 3) \right\}$$

$$8^3 = 8$$

$$= 1 - \frac{6 \times 84}{504} = 0$$

→ 1 Marks

There is no correlation b/w the marks obtained in the two subjects.

→ 1 Marks

Q.5

Attempt any two:

i. Explain Qualitative and Quantitative forecasting with example.

2.5 × 2 = 5 Marks

5

[3]

## Answer

### Qualitative Forecasting:

Qualitative forecasting relies on subjective judgment, opinions, and expert insights to predict future outcomes. It is often used in situations where historical data is limited or unreliable. Common qualitative methods include:

- Delphi Method:** Involves a panel of experts providing opinions anonymously, with feedback between rounds.
- Expert Opinion:** Relies on the knowledge and experience of individuals to make predictions.
- Market Research:** Gathering information from customers, surveys, and focus groups to gauge preferences.

### Quantitative Forecasting:

Quantitative forecasting involves using historical data and mathematical models to make predictions. It is more objective and relies on measurable factors. Examples of quantitative methods include:

- Time Series Analysis:** Examines past data to identify patterns and trends over time.
- Moving Averages:** Calculates averages of data points within a moving time window.
- Exponential Smoothing:** Assigns weights to past data points based on their recency.

### Example:

Consider a company forecasting sales for a new product:

- Qualitative Approach:** Conducting focus groups and expert interviews to understand customer preferences and market trends.
- Quantitative Approach:** Analyzing historical sales data, applying time series analysis, and using mathematical

	<p>models to predict future sales based on past patterns.</p> <p>Using a combination of both approaches, businesses can enhance the accuracy of their forecasts.</p>	
ii.	<p>Explain what is the method to ensure that chosen forecasting techniques align with company's business goal and objectives.</p> <p style="text-align: right;"><i>1 x 5 = 5 Marks</i></p> <p><b>Answer</b></p> <p>To ensure that chosen forecasting techniques align with a company's business goals and objectives, consider the following method:</p> <ol style="list-style-type: none"> <li><b>Understand Business Objectives:</b> <ul style="list-style-type: none"> <li>Begin by comprehensively understanding the company's short-term and long-term objectives. This includes sales targets, market expansion plans, and any specific goals outlined in the business strategy.</li> </ul> </li> <li><b>Define Key Performance Indicators (KPIs):</b> <ul style="list-style-type: none"> <li>Identify relevant KPIs that directly contribute to achieving the business objectives. For example, if the goal is to increase market share, KPIs could include sales growth, customer acquisition rates, and product penetration.</li> </ul> </li> <li><b>Select Appropriate Forecasting Techniques:</b> <ul style="list-style-type: none"> <li>Choose forecasting techniques that align with the nature of the business and the identified KPIs. For instance, if historical data is reliable, time series analysis may be suitable. If the market is volatile, qualitative methods involving expert opinions might be necessary.</li> </ul> </li> <li><b>Consider Industry Dynamics:</b> <ul style="list-style-type: none"> <li>Understand the industry's dynamics, including market trends, competitors, and external factors. Tailor forecasting models to accommodate industry-specific challenges and opportunities.</li> </ul> </li> </ol>	5

		<p><b>5. Validate and Adjust Models:</b></p> <ul style="list-style-type: none"> <li>Continuously validate forecasting models against actual outcomes. If there are discrepancies, adjust the models based on new information, market changes, or shifts in business strategy.</li> </ul> <p><b>6. Regular Review and Adaptation:</b></p> <ul style="list-style-type: none"> <li>Conduct regular reviews to ensure the chosen forecasting techniques remain aligned with evolving business goals. Adapt the models as the business landscape changes.</li> </ul> <p>By following these steps, businesses can ensure that their forecasting techniques are not only accurate but also strategically aligned with their overarching goals and objectives.</p>	
OR	iii.	<p>Write advantages and disadvantages of forecasting.</p> <p style="text-align: right;"><i>2.5 x 2 = 5 Marks</i></p> <p><b>Answer</b></p> <p>Forecasting is a valuable tool for businesses and organizations, but it comes with both advantages and disadvantages.</p> <p><b>Advantages of Forecasting:</b></p> <ol style="list-style-type: none"> <li><b>Planning for the Future:</b> <ul style="list-style-type: none"> <li>Forecasting allows organizations to plan for the future by anticipating market trends, demand, and potential challenges.</li> </ul> </li> <li><b>Resource Allocation:</b> <ul style="list-style-type: none"> <li>It aids in effective resource allocation by helping businesses determine the optimal use of resources, such as manpower, materials, and capital.</li> </ul> </li> <li><b>Strategic Decision-Making:</b> <ul style="list-style-type: none"> <li>Forecasting supports strategic decision-making, enabling companies to align their strategies with expected market conditions.</li> </ul> </li> <li><b>Risk Management:</b> <ul style="list-style-type: none"> <li>Organizations can proactively manage risks by</li> </ul> </li> </ol>	5

[2]

	<p>identifying potential issues through forecasting, allowing them to implement mitigation strategies.</p> <p><b>5. Performance Evaluation:</b></p> <ul style="list-style-type: none"> <li>Forecasting provides a basis for evaluating the performance of various departments and aspects of the business against anticipated outcomes.</li> </ul> <p><b>Disadvantages of Forecasting:</b></p> <ol style="list-style-type: none"> <li><b>Inaccuracy:</b> <ul style="list-style-type: none"> <li>Forecasts are never 100% accurate, and reliance on inaccurate predictions can lead to poor decision-making.</li> </ul> </li> <li><b>Assumptions and Approximations:</b> <ul style="list-style-type: none"> <li>Forecasting relies on assumptions, approximations, and historical data, introducing potential inaccuracies into the predictions.</li> </ul> </li> <li><b>Biased Opinions:</b> <ul style="list-style-type: none"> <li>Forecasting can be influenced by biased opinions, leading to predictions that may not reflect the true market conditions.</li> </ul> </li> <li><b>Data Requirement:</b> <ul style="list-style-type: none"> <li>Accurate forecasting often requires clean and comprehensive data, which may not always be readily available.</li> </ul> </li> <li><b>Time-Consuming:</b> <ul style="list-style-type: none"> <li>Developing and maintaining effective forecasting models can be time-consuming, especially in rapidly changing markets.</li> </ul> </li> </ol> <p>By considering these advantages and disadvantages, businesses can make informed decisions about the use of forecasting in their strategic planning processes.</p>
Q.6	<p><b>Attempt any two:</b></p> <p>i. Define Forecasting. Explain any four methods for Forecasting. <math>1+4 = 5</math></p>

[3]

	<h2>Answer</h2> <p><b>Forecasting</b> is a method used to make informed predictions about future trends and outcomes based on historical data and analysis. It helps organizations and businesses anticipate changes, plan for the future, and make strategic decisions.</p> <p><b>Four Forecasting Methods:</b></p> <ol style="list-style-type: none"> <li><b>Quantitative Forecasting:</b> <ul style="list-style-type: none"> <li><b>Overview:</b> Utilizes numerical data and statistical techniques.</li> <li><b>Example:</b> Time series analysis, moving averages, and regression analysis.</li> </ul> </li> <li><b>Qualitative Forecasting:</b> <ul style="list-style-type: none"> <li><b>Overview:</b> Relies on subjective judgment, opinions, and expert insights.</li> <li><b>Example:</b> Delphi method, market research, and expert opinion.</li> </ul> </li> <li><b>Straight-Line Method:</b> <ul style="list-style-type: none"> <li><b>Overview:</b> Assumes a constant rate of change over time.</li> <li><b>Example:</b> Projecting future sales based on a linear trend.</li> </ul> </li> <li><b>Moving Averages:</b> <ul style="list-style-type: none"> <li><b>Overview:</b> Smoothens variations in data by averaging values over a specified period.</li> <li><b>Example:</b> Calculating the average of sales over the last three months.</li> </ul> </li> </ol>												
	<p>ii. Find the equation of trend line to the following data by least square method:</p> <table border="1"> <thead> <tr> <th>Years</th> <th>2001</th> <th>2002</th> <th>2003</th> <th>2004</th> <th>2005</th> </tr> </thead> <tbody> <tr> <td>Value</td> <td>8</td> <td>5</td> <td>12</td> <td>10</td> <td>16</td> </tr> </tbody> </table>	Years	2001	2002	2003	2004	2005	Value	8	5	12	10	16
Years	2001	2002	2003	2004	2005								
Value	8	5	12	10	16								

[2]

Years	Value (Y)	Deviations From Middle Year (X)	$X^2$	XY
2001	8	-2	4	-16
2002	5	-1	1	-5
2004	12	0	0	0
2003	10	1	1	10
2005	16	2	4	32
N=5	51	0	10	21

— 2 Marks

*Trend Equation  $Y_t = a + bx$* *For calculating the values of  $a$  and  $b$ , we may use the following equations –*

$$\sum Y = na + b \sum X$$

$$\sum XY = a \sum X + b \sum X^2$$

$$N = 5 \quad \sum Y = 51 \quad \sum X = 0 \quad \sum XY = 21 \quad \sum X^2 = 10$$

*The Equation of trend line by least square method is :*

$$Y = a + bx$$

$$\text{Since, } \sum X = 0$$

$$a = \frac{\sum Y}{N} = \frac{51}{5} = 10.2 \quad - 1 \text{ Marks}$$

$$b = \frac{\sum XY}{\sum X^2} = \frac{21}{10} = 2.1 \quad - 1 \text{ Marks}$$

$$\therefore Y = 10.2 + 2.1X \quad - 1 \text{ Marks}$$

[3]

iii. Calculate 3 yearly moving average of the data given below:

Year	Sales ('000 Rs.)	Year	Sales ('000 Rs.)
2002	40	2009	105
2003	45	2010	100
2004	55	2011	110
2005	50	2012	140
2006	60	2013	145
2007	90	2014	155
2008	95		

5

**Answer**

Year	Sales ('000 Rs.)	3 Yearly Moving Total	3 Yearly Moving Average
2002	40	-	-
2003	45	-	-
2004	55	140	46.67
2005	50	150	50
2006	60	165	55
2007	90	200	66.67
2008	95	245	81.67
2009	105	290	96.67
2010	100	300	100
2011	110	315	105
2012	140	350	116.67
2013	145	395	131.67
2014	155	440	146.67

↓  
2 Marks↓  
3 Marks