

IMBA in FS Sem.-7 Examination
FS-703

Business Statistics-2

December-2025

Time : 2.30 Hours]

[Max.Marks : 70

Instructions:

- Questions 1, 2, 3, and 4 each have two choices. Attempt any one question from each. (Each question carries 15 marks.)
- Question 5 contains Ten sub-questions. Attempt any seven of them.
- Figures to the right indicate Full Marks.
- Do not write anything on the question paper.
- Simple calculator is allowed. Do not use a scientific calculator.

Q.1

The following table shows the data of Daily Temperature (°C) and Ice-Cream Sales (₹) recorded for 7 days.

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Day	Temperature (°C) (X)	Ice-Cream Sales (₹) (Y)
1	25	150
2	28	200
3	30	240
4	27	180
5	32	300
6	29	220
7	35	350

- a) Calculate the mean of Temperature (\bar{X}) and the mean of Sales (\bar{Y}).
- b) Compute the following for each observation:
- $x_i - \bar{X}$,
 - $y_i - \bar{Y}$, and
 - $(x_i - \bar{X})(y_i - \bar{Y})$
- c) Calculate:
- $\sum(x_i - \bar{X})(y_i - \bar{Y})$
 - $\sum(x_i - \bar{X})^2$
 - $\sum(y_i - \bar{Y})^2$

- d) Using the formula

$$r = \frac{\sum(x - \bar{X})(y - \bar{Y})}{\sqrt{\sum(x - \bar{X})^2 \cdot \sum(y - \bar{Y})^2}}$$

Calculate Karl Pearson's Correlation Coefficient (r) and interpret the result.

OR

N974.2

	<p>A researcher is studying the relationship between three variables:</p> <ul style="list-style-type: none"> • X: Hours of study • Y: Test scores • Z: Sleep duration (hours) <p>From a sample of 15 students, the following correlation coefficients were computed:</p> $r_{XY} = 0.68, r_{XZ} = 0.40, r_{YZ} = 0.55$ <p>Using the above information, answer the following:</p> <p>a) Write the formula for the partial correlation coefficient between X and Y controlling Z, i.e., $r_{XY.Z}$.</p> <p>b) Substitute the given values into the formula and show the steps of calculation clearly.</p> <p>c) Compute the numerical value of $r_{XY.Z}$.</p> <p>d) Interpret the result in one or two sentences — does the relationship between X and Y remain strong after removing the effect of Z?</p>																	
<p>Q.2</p>	<p>The table below gives the annual sales (in '000 units) of a company for seven consecutive years:</p> <table border="1" data-bbox="399 1052 1197 1176"> <thead> <tr> <th>Year</th> <th>2015</th> <th>2016</th> <th>2017</th> <th>2018</th> <th>2019</th> <th>2020</th> <th>2021</th> </tr> </thead> <tbody> <tr> <td>Sales (Y)</td> <td>52</td> <td>55</td> <td>57</td> <td>60</td> <td>63</td> <td>66</td> <td>70</td> </tr> </tbody> </table> <p>Using the Method of Least Squares, do the following:</p> <p>a) Take 2018 as the origin and assign coded values of $x = -3, -2, -1, 0, 1, 2, 3$</p> <p>Corresponding to the given years. Prepare the working table.</p> <p>b) Write the normal equations for a straight-line trend: $\Sigma Y = na + b\Sigma x, \Sigma xY = a\Sigma x + b\Sigma x^2$</p> <p>c) Calculate the values of $\Sigma Y, \Sigma x, \Sigma xY, \Sigma x^2$ from the coded table.</p> <p>d) Solve the normal equations to obtain the trend line $\hat{Y} = a + bx$</p> <p>e) Using the trend equation, estimate the sales for the year 2024.</p> <p style="text-align: center;">OR</p> <p>A business firm is considering three possible strategies for launching a new service: S1 (Aggressive Launch), S2 (Moderate Launch), and S3 (Low-Budget Launch). The profit (in ₹ '000) depends on future market conditions: High Demand, Medium Demand, and Low Demand. The payoff table is given below:</p>	Year	2015	2016	2017	2018	2019	2020	2021	Sales (Y)	52	55	57	60	63	66	70	<p>14</p>
Year	2015	2016	2017	2018	2019	2020	2021											
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N 974-3

Strategy	High Demand	Medium Demand	Low Demand
S1	90	60	20
S2	70	55	40
S3	50	48	45

Using the above information:

- Construct the regret table by calculating the regret for each strategy under each state of demand.
- Identify the maximum regret for each strategy.
- Apply the Minimax Regret Criterion to determine which strategy the firm should choose.

Q.3

A company is evaluating three investment projects: Project X, Project Y, and Project Z.

The profit (in ₹ '000) depends on future economic conditions: Good, Average, and Poor.

The payoff table is given below:

Project	Good Economy	Average Economy	Poor Economy
X	120	90	40
Y	150	70	20
Z	100	95	60

Tasks

- State the Laplace Criterion and give its formula.
- Compute the average payoff for each project by assuming all states of nature are equally likely.
- Identify the best project as per the Laplace Criterion.

OR

A firm is evaluating four strategies under three possible cost outcomes (in lakh ₹).

The lower the cost, the better for the firm.

Strategy	Cost if Raw Material is Cheap	Cost if Raw Material is Moderate	Cost if Raw Material is Expensive
S ₁	45	52	70
S ₂	38	60	80
S ₃	50	55	65
S ₄	42	48	58

Tasks

- Using the **Maximin Criterion**, identify the best strategy.
- Using the **Maximax Criterion**, identify the best strategy.
- Which strategy should be chosen if the firm is optimistic?

Q.4	<p>A company is evaluating three alternative strategies — A, B, and C — under three possible states of nature, S_1, S_2, and S_3. The payoffs (in ₹ '000) and the probabilities of each state are given below:</p> <table border="1" data-bbox="592 353 1034 510"> <thead> <tr> <th>Strategy</th> <th>S_1</th> <th>S_2</th> <th>S_3</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>40</td> <td>25</td> <td>10</td> </tr> <tr> <td>B</td> <td>30</td> <td>35</td> <td>20</td> </tr> <tr> <td>C</td> <td>50</td> <td>15</td> <td>5</td> </tr> </tbody> </table> <p>Probabilities of States</p> <ul style="list-style-type: none"> • $P(S_1) = 0.4$ • $P(S_2) = 0.35$ • $P(S_3) = 0.25$ <p>Tasks</p> <p>a) Compute the Expected Payoff under Certainty (EPUC). b) Compute the Expected Monetary Value (EMV) for each strategy and identify the best strategy based on EMV. c) Calculate the Expected Value of Perfect Information (EVPI).</p> <p style="text-align: center;">OR</p> <p>From the following data, calculate the Karl Pearson's coefficient of correlation. The arithmetic means of X and Y are 10 and 12 respectively.</p> <table border="1" data-bbox="635 1144 979 1218"> <tbody> <tr> <td>X</td> <td>8</td> <td>12</td> <td>6</td> <td>14</td> <td>10</td> </tr> <tr> <td>Y</td> <td>10</td> <td>14</td> <td>8</td> <td>?</td> <td>12</td> </tr> </tbody> </table>	Strategy	S_1	S_2	S_3	A	40	25	10	B	30	35	20	C	50	15	5	X	8	12	6	14	10	Y	10	14	8	?	12	14
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Q.5	<p>Short Questions (7 out of 10)</p> <ol style="list-style-type: none"> 1. What is meant by "payoff table"? 2. Name one method to measure trend in time series. 3. Write the formula for calculating the mean of a set of numbers. 4. What type of correlation exists when values move in opposite directions? 5. What is the main purpose of Spearman's Rank Correlation? 6. What is the name of the criterion that chooses the maximum of minimum values? 7. Write the formula for Spearman's Rank Correlation. 8. Write the formula for Karl Pearson's Correlation Coefficient. 9. What is the Maximin criterion in decision-making? 10. Define "regression." 	14																												