

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION MO/2023)

CLASS: IMSC
BRANCH: QEDS

SEMESTER : V
SESSION : MO/2023

SUBJECT: ED211 LINEAR STATISTICAL MODELS AND REGRESSION ANALYSIS
TIME: 02 Hours

FULL MARKS: 25

INSTRUCTIONS:

1. The question paper contains 5 questions each of 5 marks and total 25 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates
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| Q.1(a) Write the statement of the Gauss-Markov theorem in regression analysis. | [2] | 2 1 |
| Q.1(b) State the assumptions of simple linear regression. | [3] | 1 2 |

- Q.2 What is method of ordinary least squares (OLS) in linear regression? Derive the estimates of coefficients (β_0 and β_1) of a simple linear regression using OLS method. [5] 1 2

Q3. Data:

Advertisement Expenditure (in '000\$)	20	14	15	12	14	22	24	19	25
Sales (in '000\$)	30	23	24	22	24	26	31	28	35

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| (a) For the given data above, analyze the relationship between advertisement expenditure and sales (find regression line). | [3] | 1 4 |
| (b) Interpret the intercept and slope of the regression line. | [2] | 1 4 |
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| Q.4(a) For the same data given in Q3, calculate SST, SSR and SSE and R-square. | [3] | 2 3 |
| Q.4(b) For the same data given in Q3, Calculate the value of F-statistic and its degrees of freedom. | [2] | 2 3 |
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| Q.5(a) For the same data given in Q3, test whether the fitted regression model is significant or not [Critical value of F is 5.591 at $\alpha=0.05$] | [2] | 1 3 |
| Q.5(b) For the same data given in Q3, test the statistical significance of the slope (t – test for β_1 coefficient) and evaluate if advertisement expenditure is a significant predictor of sales. [Critical value of t-statistic is 2.635 at $\alpha=0.05$] | [3] | 1 3 |

:::27/09/2023 E:::