BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: IMSc **SEMESTER : III**
BRANCH: QEDS **SESSION : MO/2025**

SUBJECT: ED211 LINEAR STATISTICAL MODELS AND REGRESSION ANALYSIS

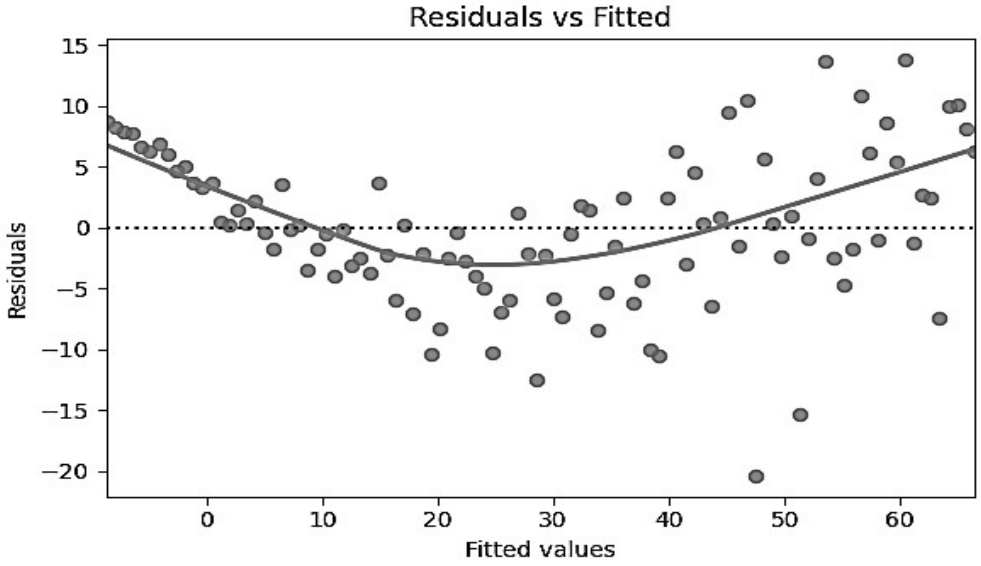
TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Derive the least squares estimates for the parameters in a simple linear regression model.	[5]	1	
Q.1(b)	1. Given summaries: $\sum_{i=1}^{n} x_i = 50, \sum_{i=1}^{n} y_i = 100, \sum_{i=1}^{n} x_i y_i = 1100, \sum_{i=1}^{n} x_i^2 = 350, n = 10$ Compute the regression model $\hat{y} = \omega_0 + \omega_1 x$.	[5]	1	
Q.2(a)	State the assumptions of the multiple linear regression model.	[5]	2	
Q.2(b)	Formulate the multiple linear regression model: $y = \omega_0 + \omega_1 x_1 + \omega_2 x_2 + \epsilon$ and compute the normal equations for the dataset:	[5]	2	

x_1	200	220	250	270	300
x_2	4	5	5	6	7
y	50	55	60	65	70

Q.3(a)	What is stepwise regression? Discuss its advantages and disadvantages.	[5]	3	
Q.3(b)	Explain the steps in variable selection.	[5]	3	
Q.4(a)	Interpret the residual plot a linear model and suggest the possible remedy:	[5]	4	



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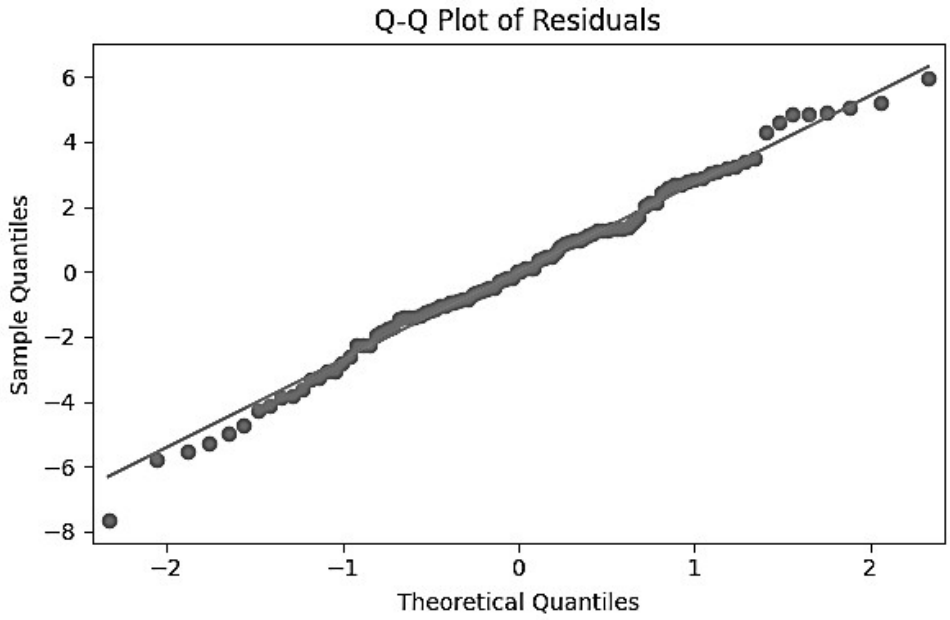
Q.4(b) Interpret the Q-Q plot and suggest the possible remedy: [5] 4



Q.5 Fit a logistic regression model and a Probit model using the dataset [10] 5

x_1	320	300	310	280	330
x_2	3.5	3.0	3.2	2.8	3.8
y	1	0	1	0	1

where y is the binary response and x_1, x_2 are predictors. Compare logit and probit models in terms of link function and typical applications.

::::::26/11/2025::::::E