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

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

SUBJECT: ED24211 LINEAR 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**

			CO	BL
Q.1(a)	Define the simple linear regression model with all possible assumptions.	[2]	1	
Q.1(b)	Estimate the parameters in simple linear regression using normal equation	[3]	1	
Q.2(a)	Define design matrix, response vector, predicted response vector, sum of squared error, sum of squared total for a simple linear regression with given data set $\{(x_i, y_i)\}_{i=1}^{n}$	[2]	1	
Q.2(b)	Predicting exam score based on hours studied from the following data set:	[3]	1	

X (study hours)	2	4	6	8	10
Y (exam score)	50	55	65	70	80

Q.3(a)	Define the multiple linear regression model with all possible assumptions.		[2]	3	
Q.3(b)	Estimate the parameters in multiple linear regression using normal equation		[3]	3	
Q.4(a)	Predicting crop yield based on rainfall and fertilizer from the following dataset:		[2]	3	

x1 (rainfall in mm)	100	120	130	150	170
x2 (fertilizer in kg)	50	60	65	70	80
Y (crop yield)	200	220	230	250	270

Q.4(b)	Compute predicted response vector, sum of squared error, sum of squared total for a simple linear regression with the dataset of Q.4(a)		[3]	3	
Q.5(a)	Explain forward, backward and stepwise regressions for variable selections in a multiple regression		[2]	3	
Q.5(b)	Explain which one is the first incoming predictor in the following result of partial linear regression:		[3]	3	

Predictor	Coef	SE Coef	T	P
Constant	81.479	4.927	16.54	0.000
x1	1.8687	0.5264	**3.55**	**0.005**

Predictor	Coef	SE Coef	T	P
Constant	57.424	8.491	6.76	0.000
x2	0.7891	0.1684	**4.69**	**0.001**

Predictor	Coef	SE Coef	T	P
Constant	110.203	7.948	13.87	0.000
x3	-1.2558	0.5984	**-2.10**	**0.060**

Predictor	Coef	SE Coef	T	P
Constant	117.568	5.262	22.34	0.000
x4	-0.7382	0.1546	**-4.77**	**0.001**

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