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**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION**

**SEMESTER I**

**SESSION 2019/2020**

COURSE NAME : APPLIED REGRESSION ANALYSIS

COURSE CODE : BWB 20803

PROGRAMME CODE : BWQ

EXAMINATION DATE : DECEMBER 2019/ JANUARY 2020

DURATION : 3 HOURS

INSTRUCTION : ANSWER ALL QUESTIONS

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THIS EXAMINATION PAPER CONSISTS OF FIVE (5) PAGES

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- Q1** Various doses of poisonous substance were given to groups of 25 mice and the following results were obtained in **Table Q1**:

**Table Q1**

Dose (mg) $x$	Number of deaths $y$
4	1
6	3
8	6
10	8
12	14
14	16
16	20

- (a) Estimate the equation of least square line fit to these data. (12 marks)
- (b) Calculate the sample correlation coefficient between the dose and the number of death. Interpret the result. (5 marks)
- (c) Calculate the value of Sum Squares Error ( $SSE$ ) and Mean Square Error ( $MSE$ ). (6 marks)
- (d) At the 0.05 level of significance, test the slope greater than one . (9 marks)
- Q2** Given linear equation function

$$Y = \beta_0 + \beta_1 X + \varepsilon$$

Using method of least square estimation, estimate  $\widehat{\beta}_1$  and  $\widehat{\beta}_0$ .

(10 marks)

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**Q3** Given the Analysis of Variance (ANOVA) for the simple linear regression as **Table Q3** below:

**Table Q3: ANOVA**

Source	df	SS	MS	F
Regression	1	27.8345	<i>C</i>	<i>E</i>
Error	<i>A</i>	0.655	<i>D</i>	
Total	5	<i>B</i>		

- (a) Calculate *A*, *B*, *C*, *D* and *E*. (5 marks)
- (b) At  $\alpha = 0.05$  test whether the regression model are fit. (8 marks)

**Q4** Given the data in **Table Q4** below:

**Table Q4**

<i>Y</i>	<i>X</i> <sub>1</sub>	<i>X</i> <sub>2</sub>
1	2	34
2	4	31
3	6	28
4	8	24
5	9	22
6	13	19
7	15	15
8	17	12
9	17	9
10	20	6
11	23	3

- (a) Sketch the scatter plot of the data *Y* vs *X* (*X*<sub>1</sub>&*X*<sub>2</sub>) in one diagram. (4 marks)
- (b) Using matrix notation of OLS, construct the multiple linear model and interpret your result. (18 marks)

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**Q5** Refer to the output of MINITAB given in **Figure Q5**

- (a) Write the fitted model. (1 marks)
- (b) State and interpret the value of coefficient of determination. (3 marks)
- (c) At 0.1 level of significant, test the given model. (8 marks)
- (d) Define multicollinearity and explain **TWO (2)** method to detect multicollinearity. (4 marks)
- (e) How to overcome multicollinearity on a data set? (4 marks)
- (f) Justify whether multicollinearity exist in the data. (3 marks)

**- END OF QUESTIONS -**

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Regression Analysis: y versus x1, x2

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	2	27.9170	13.9585	672.40	0.000
x1	1	0.0824	0.0824	3.97	0.117
x2	1	0.3453	0.3453	16.64	0.015
Error	4	0.0830	0.0208		
Total	6	28.0000			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0.144081	99.70%	99.56%	98.66%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	5.54	1.44	3.86	0.018	
x1	0.1661	0.0833	1.99	0.117	36.70
x2	-0.3238	0.0794	-4.08	0.015	36.70

Figure Q5

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