NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF MANAGEMENT SCIENCES

DEPARTMENT OF ACCOUNTING, ECONOMICS AND FINANCE

QUALIFICATION: BACHELOR OF ECONOMICS	
QUALIFICATION CODE: 12BECO	**LEVEL:** 7
COURSE CODE: ECM712S	**COURSE NAME**: ECONOMETRICS
SESSION: NOVEMBER 2019	**PAPER:** THEORY
DURATION: 3 HOURS	**MARKS:** 100

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
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MODERATOR:	**DR R. KAMATI**

INSTRUCTIONS
1. Answer ALL the questions. 2. Write clearly and neatly. 3. Number the answers clearly.

PERMISSIBLE MATERIALS

1. PEN,
2. PENCIL
3. CALCULATOR

THIS QUESTION PAPER CONSISTS OF 4 PAGES (Including this front page)

SECTION A **[20 MARKS]**

MULTIPLE CHOICE QUESTIONS

1. The statistical significance of a parameter in a regression model refers to:
   a) The conclusion of testing the null hypothesis that the parameter is equal to zero, against the alternative that it is non-zero.
   b) The probability that the OLS estimate of this parameter is equal to zero.
   c) The interpretation of the sign (positive or negative) of this parameter.
   d) All of the above

2. All of the following are possible effects of multicollinearity EXCEPT:
   a) the variances of regression coefficients estimators may be larger than expected
   b) the signs of the regression coefficients may be opposite of what is expected
   c) a significant F ratio may result even though the t ratios are not significant
   d) removal of one data point may cause large changes in the coefficient estimates
   e) the VIF is zero

3. Suppose that you estimate the model $Y = \beta_0 + \beta_1 X + u$. You calculate residuals and find that the explained sum of squares is 400 and the total sum of squares is 1200.
   The R-squared is
   a) 0.25
   b) 0.33
   c) 0.5
   d) 0.67

4. In linear regression, the assumption of homoscedasticity is needed for
   I. unbiasedness
   II. simple calculation of variance and standard errors of coefficient estimates.
   III. the claim that the OLS estimator is BLUE.
   a) I only.
   b) B) II only.
   c) C) III only.
   d) D) II and III only.
   e) E) I, II, and III.

5. Which of the following is/are consequences of over specifying a model (including irrelevant variables on the right-hand-side)?
   I. The variance of the estimators may increase.
   II. The variance of the estimators may stay the same.
   III. Bias of the estimators may increase.
   a) I only.
   b) II only.
   c) III only.
   d) I and II only.
   e) I, II, and III.

6. Heteroscedasticity means that
   a) Homogeneity cannot be assumed automatically for the model.
   b) the observed units have different preferences.
   c) the variance of the error term is not constant.
   d) agents are not all rational.

7. In a two regressor regression model, if you exclude one of the relevant variables then
   a) OLS is no longer unbiased, but still consistent.
   b) the OLS estimator no longer exists.
   c) you are no longer controlling for the influence of the other variable.
   d) it is no longer reasonable to assume that the errors are homoscedastic.

8. By including another variable in the regression, you will
   a) look at the t-statistic of the coefficient of that variable and include the variable only if the coefficient is statistically significant at the 1% level.
   b) eliminate the possibility of omitted variable bias from excluding that variable.
   c) decrease the regression R^2 if that variable is important.
   d) decrease the variance of the estimator of the coefficients of interest.

9. Which of the following statements is TRUE concerning OLS estimation?
   a) OLS minimises the sum of the vertical distances from the points to the line
   b) OLS minimises the sum of the squares of the vertical distances from the points to the line
   c) OLS minimises the sum of the horizontal distances from the points to the line
   d) OLS minimises the sum of the squares of the horizontal distances from the points to the line.
10. The residual from a standard regression model is defined as
   a) The difference between the actual value, y, and the mean, y-bar
   b) The difference between the fitted value, y-hat, and the mean, y-bar
   c) The difference between the actual value, y, and the fitted value, y-hat
   d) The square of the difference between the fitted value, y-hat, and the mean, y-bar

SECTION B **[80 MARKS]**

QUESTION 1[30 marks]

1. Discuss any of the five CLRM assumptions underlying the method of least squares? (10)
2. Show that the OLS slope coefficient estimator $\hat{\beta}_2$ is linear function of Y_i sample value? (5)
3. Convert the following intrinsically functions into linear equations.
   (a) $Y_t = e^{\beta_1+\beta_2 X_t+u_t}$ (5)
   (b) $Y_t = \frac{1}{1+e^{\beta_1+\beta_2 X_t+u_t}}$ (5)
   (c) $Y_t = \beta_1 + \beta_2\left(\frac{1}{X_t}\right) + u_t$ (5)

Question 2 [25 marks]

WEEKLY FAMILY INCOME X, $

$Y_\downarrow$ \ $X\rightarrow$	80	100	120	140	160	180	200	220	240	260
Weekly family consumption expenditure Y, $	55	65	79	80	102	110	120	135	137	150
	60	70	84	93	107	115	136	137	145	152
	65	74	90	95	110	120	140	140	155	175
	70	80	94	103	116	130	144	152	165	178
	75	85	98	108	118	135	145	157	175	180
	–	88	–	113	125	140	–	160	189	185
	–	–	–	115	–	–	–	162	–	191

1. Given the table above compute the following:
   (a) The conditional mean (5)
   (b) The unconditional mean (3)
2. Define the stochastic disturbance term and three reasons why it exists? (8)
3. Given $\sum \hat{u}_i^2 = \sum(Y_i - \hat{\beta}_1 - \hat{\beta}_2 X_i)^2$ derive the normal equations and eventually the estimation equations for $\hat{\beta}_1$ *and* $\hat{\beta}_2$ (9)

QUESTION 3 [25 marks]

Given the following information on weekly family income (X) and weekly family consumption (Y)

Y	X
55	80
88	100
90	120
80	140
118	160
120	180
145	200
135	220
145	240
175	260

1. Estimate the regression line from the given sample observations (show all your works)? (15)
2. Compute the variance of the estimated residuals? (4)
3. Work out the var($\hat{\beta}_2$) and se($\hat{\beta}_2$)? (4&2=6)

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