UNIVERSITY OF ESWATINI

FACULTY OF SOCIAL SCIENCES

DEPARTMENT OF ECONOMICS

MAIN EXAMINATION DECEMBER 2018

TITLE OF PAPER	:	**INTRODUCTION TO ECONOMETRICS I**
COURSE CODE	:	**ECO 307**
TIME ALLOWED	:	**TWO (2) HOURS**

INSTRUCTIONS :

1. **ANSWER QUESTION ONE (1) AND ANY OTHER TWO (2) IN THIS PAPER.**
2. **ONLY SCIENTIFIC NON-PROGRAMMABLE CALCULATORS ARE ALLOWED.**
3. **ROUND UP YOUR FINAL ANSWERS TO THREE (3) DECIMAL PLACES.**
4. **IF IT IS NOT SPECIFIED, USE $\alpha = 0.05$ FOR STATISTICAL TESTS.**
5. **THE REQUIRED PROBABILITY TABLES ARE ATTACHED AT THE BACK OF QUESTION PAPER.**

THIS PAPER IS NOT TO BE OPENED UNTIL PERMISSION HAS BEEN GRANTED BY THE INVIGILATOR

QUESTION 1 (Compulsory

[40 MARKS]

a) With the aid of an example, briefly explain the "dummy variable trap" [6 Marks]

b) Provide a simple proof that the residuals and fitted values from an OLS model are uncorrelated $(\sum \hat{y}_i \hat{u}_i = 0)$ [6 Marks]

c) The table below shows sample data of CEO salaries (y) in Emalangeni and the companies' return on equity (ROE) (x) in percentages:

Salary	1095	1001	1122	578	1368	1145	1078	1094	1237	833
ROE	14.1	10.9	23.5	5.9	13.8	20	16.4	16.3	10.5	26.3

i) Use the data to fit a regression line.(Show working for full marks) [16 Marks]

ii) Interpret the slope coefficient of the regression. [6 Marks]

iii) If the calculated coefficient of determination (R^2) for the above data is 0.2052, interpret what it means. [6 Marks]

ANSWER ANY TWO QUESTIONS FROM THE FOLLOWING QUESTIONS

QUESTION 2

[25 MARKS]

Consider an estimated model for the number of defective products $(Defect)$ per 100 units of production, for a citrus canning factory in Malkerns. $Hrsemp$ is the total training hours provided to employees, and $Employ$ is the number of workers in a shift.

$$\widehat{Log(Defect)} = 11.74 + 0.42Hrsemp - 0.083\log(Employ)$$
$$(4.57) \quad (0.019) \quad (0.360)$$
$$n = 43, \qquad R^2 = 0.310$$

Note that the values in brackets are standard errors.

a) Interpret the model. [6 Marks]

b) Briefly explain whether the signs of the coefficients make sense. [5 Marks]

c) Using the standard normal table approximation, find the 95% confidence interval for β_{Hrsemp}. [8 Marks]

d) Are you able to reject the null hypothesis $H_0 : \beta_{Hrsemp} = 0$ at the 5% level of significance?

[5 Marks]

e) What is the $p - value$ that can be attached on coefficient of the log of the number of workers working in a shift $(\beta_{Log(Employ)})$. Furthermore, explain what this $p - value$ means.

[6 Marks]

QUESTION 3

[30 MARKS]

The following model based on SAT scores was estimated:

$$\widehat{SAT} = 1{,}028.10 + 19.30\, hsize - 45.09\, female - 169.81\, Black + 62.31\, female * Black$$
$$(6.29) \qquad (3.83) \qquad (4.29) \qquad (12.71) \qquad (18.15)$$
$$n = 4{,}137 \qquad R^2 = 0.0858$$

Where SAT is the SAT score of a student, $hsize$ is the high school class size of student, $female$ is a gender variable (=1 is student is female), $Black$ is a race variable (=1 for Black and 0 otherwise)

a) Holding $hsize$ fixed, what is the estimated difference in SAT score between nonblack females and nonblack males?

[7 Marks]

b) Is the estimated difference in (a) above statistically significant? [8 Marks]

c) What is the estimated difference in SAT score between Black females and nonblack females?

[8 Marks]

d) How would you test for the statistical significance of the difference in (c) above?

[7 Marks]

QUESTION 4 [30 MARKS]

The following partial output was obtained from running a model of the following form in Stata : $y_i = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + u_i$

Source	SS	df	MS	Number of Obs =	526
Model	1927.877	3	642.625576	F(3, 522) =	64.11
Residual	5232.538	522	10.0240183	Prob > F =	0.0000
Total	7160.414	525	13.6388844	R - Squared =	
				Root MSE =	3.1661

wage	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
Log(educ)	0.595343	0.053025		0.000	0.491174	0.6995118
exper	0.268287	0.036897		0.000	0.195802	0.3407717
expersq	-0.00461	0.000822		0.000	-0.00623	-0.002998
Constant	-3.96489	0.752153		0.000	-5.44251	-2.487272

Where : wage – hourly wage, educ – education level in years, exper – experience level, expersq – experience square

a) Briefly explain why a quadratic term may be included in a regression model. [4 Marks]

b) State the fitted regression line. [4 Marks]

c) Interpret the coefficient $\beta_{Log(educ)}$ [6 Marks]

d) Test the hypothesis that $\beta_{Constant} = 0$ against $\beta_{Constant} \neq 0$ at the 1% level of significance. [5 Marks]

e) Does the data provide evidence that $expersq$ contributes useful information in the prediction of wages? [6 Marks]

f) Calculate the Goodness of Fit measure (R^2) and interpret it. [5 Marks]