NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OFCOMMERCE, HUMAN SCIENCE AND EDUCATION

DEPARTMENT OF ECONOMICS, ACCOUNTING AND FINANCE

QUALIFICATION: BACHELOR OF ECONOMICS	
QUALIFICATION CODE: 07BECO	**LEVEL: 7**
COURSE CODE: ECM712S	**COURSE NAME**: ECONOMETRICS
SESSION: JUNE 2023	**PAPER:** THEORY
DURATION: 3 HOURS	**MARKS:** 100

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
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INSTRUCTIONS
1. Answer ALL the questions in section A and B 2. Write clearly and neatly. 3. Number the answers clearly.

PERMISSIBLE MATERIALS

1. Scientific calculator
2. Pen and Pencil
3. Ruler

This question paper consists of _6_ pages (including this front page)

SECTION A [20 MARKS]

MULTIPLE CHOICE QUESTIONS

1. OLS stands for what in Econometrics?
   a) Optimally Linearized Solution
   b) There is no such thing in Econometrics
   c) The only rock band that Econometricians are crazy about
   d) Ordinary Least Squares

2. Data collected at a point in time is called
   a) Cross-sectional data
   b) Time series data
   c) Pooled data
   d) Panel data

3. Data collected for a variable over a period of time is called
   a) Cross-sectional data
   b) Time series data
   c) Pooled data
   d) Panel data

4. In the estimated model $\widehat{logQ_i} = 2.25 - 0.7logP_i + 0.02Y_i$, where p is the price and q is the quantity demanded of a certain good and Y is disposable income, what is the interpretation of the coefficient on logP?
   a) If the price increases by 1%, the demanded quantity will be 0.007% lower on average, ceteris paribus
   b) If the price increases by 1%, the demanded quantity will be 70% lower on average, ceteris paribus
   c) If the price increases by 1%, the demanded quantity will be 0.7% lower on average, ceteris paribus
   d) None of the answers above is correct

5. In the estimated model $\widehat{logQ_i} = 2.25 - 0.7logP_i + 0.02Y_i$, where p is the price and q is the quantity demanded of a certain good and Y is disposable income, what is the meaning of the coefficient on logY?
   a) If disposable income increases by a thousand dollars, the demanded quantity will be 0.02% higher on average, ceteris paribus
   b) If disposable income increases by a thousand dollars, the demanded quantity will be 0.0002% higher on average, ceteris paribus

c) If disposable income increases by a thousand dollars, the demanded quantity will be 2% higher on average, ceteris paribus
d) None of the answers above is correct

6. Which of the following are alternative names for the dependent variable (usually denoted by y) in linear regression analysis?
   a) The regressand
   b) The regressor
   c) The explanatory variable
   d) None of the above

7. 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.

8. 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

9. Which one of the following statements best describes the algebraic representation of the fitted regression line?
   a) $\hat{y}_t = \hat{\alpha} + \hat{\beta}x_t + \hat{u}_t$
   b) $\hat{y}_t = \hat{\alpha} + \hat{\beta}x_t$
   c) $\hat{y}_t = \hat{\alpha} + \hat{\beta}x_t + u_t$
   d) $y_t = \hat{\alpha} + \hat{\beta}x_t + \hat{u}_t$

10. Which one of the following statements best describes a Type II error?
    a. It is the probability of incorrectly rejecting the null hypothesis
    b. It is equivalent to the power of the test
    c. It is equivalent to the size of the test
    d. It is the probability of failing to reject a null hypothesis that was wrong

SECTION B **[80 MARKS]**

QUESTION ONE **[30 MARKS]**

a) Summary output table of $\hat{Y}_i = \hat{\beta}_1 + \hat{\beta}_2 X_i$ where y-hat is the estimated consumption and x is consumer level of income

Multiple R	0.998906
R Square	**i)**
Adjusted R Square	0.997614
Standard Error	21.14699
Observations	13

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	2244134	2244134	5018.24	5.51E-16
Residual	11	**iv)**	447.1954		
Total	12	2249053			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	-158.409	56.99757	**ii)**	0.017929	-283.86
X(Income)	**iii)**	0.009905	70.83953	5.51E-16	0.679847

Use the information above to answer the following questions:

i) Calculate R^2 of this model [3 marks]

ii) Calculate the t statistics of the intercept [3 marks]

iii) Calculate slope coefficient or income parameter [3 marks]

iv) Calculate residual sum of square (RSS) [3 marks]

v) Is this model supposed to be an intercept present model or intercept absent model if adjusted R^2=0.916624 of the absent intercept model? [6 marks]

b) Given the following two summary output tables

Summary output table 1

$$[\hat{Y}_i = \hat{\beta}_1 + \hat{\beta}_2 X_i + \hat{\beta}_3 GD_i]$$

Regression Statistics	
Multiple R	0.999074
R Square	0.998149
Adjusted R Square	0.987779
Standard Error	20.40407
Observations	13

	df	*SS*	*MS*	*Significance F*
Regression	2	2244890	1122445	2.17E-14
Residual	10	4163.263	416.3263	
Total	12	2249053		

	Coefficients	*Standard Error*	*t Stat*	*Lower 95%*	*Upper 95%*
Intercept	-155.853	55.02788	-2.83226	-278.463	-33.2437
Xi	0.700197	0.009617	72.80746	0.678769	0.721626
GDi	0.000272	0.000202	1.347446	-0.00018	0.000723

Summary output table 2

$$[\hat{Y}_i = \hat{\beta}_1 + \hat{\beta}_2 X_i]$$

Multiple R	0.998906
R Square	0.997813
Adjusted R Square	0.999914
Standard Error	21.14699
Observations	13

	df	*SS*	*MS*	*Significance F*
Regression	1	2244134	2244134	5.5104E-16
Residual	11	4919.149	447.1954	
Total	12	2249053		

	Coefficients	*Standard Error*	*t Stat*	*Lower 95%*	*Upper 95%*
Intercept	-158.409	56.99757	-2.77923	-283.86022	-32.9586
Xi	0.701647	0.009905	70.83953	0.67984663	0.723447

Did we make a mistake by including government debt (GD) in the model? Use evidence from the two summaries out table to justify your answer. [12 marks]

QUESTION TWO **[25 MARKS]**

A researcher is using data for a sample of 10 consumers to investigate the relationship between the annual consumption C_i and annual income I_i.

Year	Income, I_i	Consumption, C_i
2010	12003	10810
2011	13307	11000
2012	14001	13706
2013	15305	14605
2014	18707	16807
2015	19905	18203
2016	21502	20207
2017	23202	22406
2018	25603	24202
2019	27904	25508

Use the information in the table above to compute the following:

a) $\sum_{i=1}^{N} i^2{}_i = ?$ [5 marks]

b) $\sum_{i=1}^{N} c_i{}^2 = ?$ [5 marks]

c) $\sum_{i=1}^{N} \hat{c}_i^2 = ?$ [15 marks]

QUESTION THREE **[25 MARKS]**

a) With proper examples draw a distinction between mathematical and econometric model? [6 marks]

b) Discuss the two types of error that arise in hypothetical conclusions [4 marks]

c) Explain four differences between model with intercept and model without intercept [8 marks]

d) Given $\hat{Y}_i = 7.6182 + 0.08145X_i$ and $\bar{Y} = 29$, $\bar{X} = 262.5$. Use elasticity of expenditure to interpret the model above. [4 marks]

e) What do we mean by a linear regression model in parameters? [3 marks]

All the best

Table entry for p and C is the critical value t^* with probability p lying to its right and probability C lying between $-t^*$ and t^*.

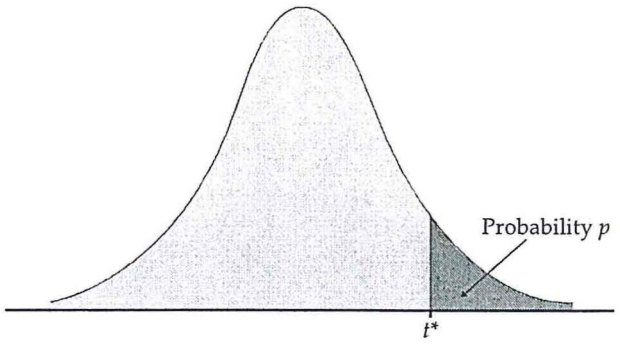

TABLE D

t distribution critical values

	Upper-tail probability p											
df	.25	.20	.15	.10	.05	.025	.02	.01	.005	.0025	.001	.0005
1	1.000	1.376	1.963	3.078	6.314	12.71	15.89	31.82	63.66	127.3	318.3	636.6
2	0.816	1.061	1.386	1.886	2.920	4.303	4.849	6.965	9.925	14.09	22.33	31.60
3	0.765	0.978	1.250	1.638	2.353	3.182	3.482	4.541	5.841	7.453	10.21	12.92
4	0.741	0.941	1.190	1.533	2.132	2.776	2.999	3.747	4.604	5.598	7.173	8.610
5	0.727	0.920	1.156	1.476	2.015	2.571	2.757	3.365	4.032	4.773	5.893	6.869
6	0.718	0.906	1.134	1.440	1.943	2.447	2.612	3.143	3.707	4.317	5.208	5.959
7	0.711	0.896	1.119	1.415	1.895	2.365	2.517	2.998	3.499	4.029	4.785	5.408
8	0.706	0.889	1.108	1.397	1.860	2.306	2.449	2.896	3.355	3.833	4.501	5.041
9	0.703	0.883	1.100	1.383	1.833	2.262	2.398	2.821	3.250	3.690	4.297	4.781
10	0.700	0.879	1.093	1.372	1.812	2.228	2.359	2.764	3.169	3.581	4.144	4.587
11	0.697	0.876	1.088	1.363	1.796	2.201	2.328	2.718	3.106	3.497	4.025	4.437
12	0.695	0.873	1.083	1.356	1.782	2.179	2.303	2.681	3.055	3.428	3.930	4.318
13	0.694	0.870	1.079	1.350	1.771	2.160	2.282	2.650	3.012	3.372	3.852	4.221
14	0.692	0.868	1.076	1.345	1.761	2.145	2.264	2.624	2.977	3.326	3.787	4.140
15	0.691	0.866	1.074	1.341	1.753	2.131	2.249	2.602	2.947	3.286	3.733	4.073
16	0.690	0.865	1.071	1.337	1.746	2.120	2.235	2.583	2.921	3.252	3.686	4.015
17	0.689	0.863	1.069	1.333	1.740	2.110	2.224	2.567	2.898	3.222	3.646	3.965
18	0.688	0.862	1.067	1.330	1.734	2.101	2.214	2.552	2.878	3.197	3.611	3.922
19	0.688	0.861	1.066	1.328	1.729	2.093	2.205	2.539	2.861	3.174	3.579	3.883
20	0.687	0.860	1.064	1.325	1.725	2.086	2.197	2.528	2.845	3.153	3.552	3.850
21	0.686	0.859	1.063	1.323	1.721	2.080	2.189	2.518	2.831	3.135	3.527	3.819
22	0.686	0.858	1.061	1.321	1.717	2.074	2.183	2.508	2.819	3.119	3.505	3.792
23	0.685	0.858	1.060	1.319	1.714	2.069	2.177	2.500	2.807	3.104	3.485	3.768
24	0.685	0.857	1.059	1.318	1.711	2.064	2.172	2.492	2.797	3.091	3.467	3.745
25	0.684	0.856	1.058	1.316	1.708	2.060	2.167	2.485	2.787	3.078	3.450	3.725
26	0.684	0.856	1.058	1.315	1.706	2.056	2.162	2.479	2.779	3.067	3.435	3.707
27	0.684	0.855	1.057	1.314	1.703	2.052	2.158	2.473	2.771	3.057	3.421	3.690
28	0.683	0.855	1.056	1.313	1.701	2.048	2.154	2.467	2.763	3.047	3.408	3.674
29	0.683	0.854	1.055	1.311	1.699	2.045	2.150	2.462	2.756	3.038	3.396	3.659
30	0.683	0.854	1.055	1.310	1.697	2.042	2.147	2.457	2.750	3.030	3.385	3.646
40	0.681	0.851	1.050	1.303	1.684	2.021	2.123	2.423	2.704	2.971	3.307	3.551
50	0.679	0.849	1.047	1.299	1.676	2.009	2.109	2.403	2.678	2.937	3.261	3.496
60	0.679	0.848	1.045	1.296	1.671	2.000	2.099	2.390	2.660	2.915	3.232	3.460
80	0.678	0.846	1.043	1.292	1.664	1.990	2.088	2.374	2.639	2.887	3.195	3.416
100	0.677	0.845	1.042	1.290	1.660	1.984	2.081	2.364	2.626	2.871	3.174	3.390
1000	0.675	0.842	1.037	1.282	1.646	1.962	2.056	2.330	2.581	2.813	3.098	3.300
z^*	0.674	0.841	1.036	1.282	1.645	1.960	2.054	2.326	2.576	2.807	3.091	3.291
	50%	60%	70%	80%	90%	95%	96%	98%	99%	99.5%	99.8%	99.9%
	Confidence level C											