Strathmore
UNIVERSITY

**SCHOOL OF FINANCE AND APPLIED ECONOMICS**
**BBS Financial Economics, BBS Actuarial Science & BBS Finance**
**END OF SEMESTER EXAMINATION**
**BSA 2205: ECONOMETRICS II**

**DATE: 10th November 2016** **TIME: 2 Hours**

INSTRUCTIONS

1) ***Answer question one and any other two questions***
2) ***Question one is compulsory and carries 30 marks***
3) ***All other questions carry 20 marks each***

**Question 1 (30 marks)**

Briefly discuss the following as applied in econometrics **(6 marks each):**

(i) The concept of unbiasedness of parameter estimates

(ii) The relevance of the Gauss-Markov theorem

(iii) Method of Moments estimation

(iv) Realistic Solutions to Multi-collinearity problem

(v) The limitation of using Least squares to estimate a linear probability models

**Question 2 (20 marks)**

a) Clearly demonstrate that Instrumental variable and Ordinary Least Squares estimation are special cases of method of moments modeling technique (be *sure to indicate their respective othorgonality conditions in your responses*). **(10 marks)**

b) Consider the following time series model:

$$y_t = \beta_0 + \beta_1 x_{1t} + \beta_2 x_{2t} + \varepsilon_t$$

Where $y_t$ is some outcome variable of interest, and $x_{1t}$ and $x_{2t}$ are strictly exogenous explanatory variables. Clearly, describe how one would test for Serial Correlation in the residual term $\varepsilon_t$ using Breusch Godfrey Test? **(10 marks)**

**Question 3 (20 marks)**

a) Discuss three merits and three demerits of maximum likelihood estimation **( 6 marks)**

b) Assume a normal distribution of errors in the model $Y = X\beta + \varepsilon$, where $Y$ is the dependent variable, $X$ a vector of independent variables, $\beta$ is a vector of coefficients and $\varepsilon$ is the error term. Using this information, show that error variances generated from Maximum Likelihood Estimation is lower than that generated by Ordinary Least Squares (OLS) estimation (*use the unbiased estimate for error variance from OLS given by :* $\delta^2 = \frac{1}{n-k}\sum(Y - X\beta)'(Y - X\beta)$ ***).*** **( 10 marks)**

c) Based on your results in (b) above, derive the variance of $\beta$ (***Hint.*** *Use the information matrix).* **(4 marks)**

**Question 4 (20 marks)**

a) Discuss Heteroskedasticity, its sources and consequences in econometrics **(6 marks)**

b) Outline a step by step process of how you would test for Heteroscedasticity using *White* test. Assume that heteroskedasticity is confirmed present, enlist at least two approaches that one can use to solve the problem (*consider the case where the form of Heteroscedasticity is known and when it is not known*) **( 7 marks)**

c) Discuss salient features of Generalized Method of Moments **( 6 marks)**

**Question 5 (20 marks)**

a) A second year student of Financial Economics at Strathmore University discovered after conducting regression using time series data of the model $y_t = \beta_0 + \beta_1 x_t + e_t$ that the variance of errors was not constant, but given by the expression $\delta^2 x^2{}_t$ . Use the information to answer the following questions:

(i) Clearly outline how the student should go about estimations using Generalized Least Squares estimation technique. **(7 marks)**

(ii) In addition, prove that the approach makes the variance of the errors constant and equal to $\delta^2$ . **(3 marks)**

b) Consider a hypothetical function describing a distribution of x:

$f(x) = \phi x^{\phi-1}$ where $0 \leq x \leq 1$

Derive the maximum likelihood estimate for $\phi$ **(10 marks)**

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