JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF MATHEMATICS AND ACTUARIAL SCIENCE

UNIVERSITY EXAMINATION FOR DEGREE OF BACHELOR OF SCIENCE ACTUARIAL

3RD YEAR 1ST SEMESTER 2018/2019 ACADEMIC YEAR

REGULAR (MAIN)

COURSE CODE: SAC 307

COURSE TITLE: FINANCIAL ECONIMICS

EXAM VENUE: **STREAM: (BSc. ACTUARIAL SCIENCE)**

DATE: **EXAM SESSION:**

TIME: 2.00 HOURS

Instructions:

1. **Answer question 1 (Compulsory) and ANY other 2 questions**
2. **Candidates are advised not to write on the question paper.**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room.**

QUESTION 1 [COMPULSORY] [30 Marks]

(a) State the expected utility theorem. [**2 Marks**]

(b) By considering the relationship $R(w) = w.A(w)$, explain which of the following statements is true.

1. If an investors preferences display decreasing relative risk aversion then they must also display decreasing absolute risk aversion.

2. If an investors preferences display decreasing absolute risk aversion then they must also display decreasing relative risk aversion.

[**4 Mark**]

(c) A horse trading fan assesses her utility of wealth using the utility function;

$$U(w) = 2(w^{0.5} - 1)$$

Prove algebraically that the horse trading fan is;

(i)Non-satiated [**4 Marks**]

(ii)Risk averse [**4 Marks**]

(d) Consider two risky assets A and B with the cumulative distribution function

$$F_A(w) = w$$

$$F_B(w) = w^{\frac{1}{2}}$$

In both cases $0 \leq w \leq 1$.

Show that A is preferred to B on the basis of first order stochastic dominance. [**8 Marks**]

(e) Consider assets A and B which offer returns as set out in the following table.

Asset	**Return,$\bar{r}$(%)**	**Standard Deviation,σ(%)**
A	10	15
B	18	30

The correlation coefficient between the assets is 0.4

(i)Find the proportion α of A and $(1-\alpha)$ of B that define a portfolio of A and B having a minimum standard deviation. [**4 Marks**]

(ii)What is the value of this minimum standard deviation?. [**2 Marks**]

(iii)What is the expected return of this portfolio? [**2 Marks**]

QUESTION 2 [20 Marks]

(a) Define first and second-order stochastic dominance. [**5 Marks**]

(b) Consider four assets which deliver a one year return r_i on asset i with the probabilities as set out below:

	$P(r_i = -5\%)$	$P(r_i = -3\%)$	$P(r_i = 0\%)$	$P(r_i = 3\%)$	$P(r_i = 5\%)$
Asset 1	0.2	0.2	0.2	0.2	0.2
Asset 2	0.3	0.2	0.1	0.2	0.2
Asset 3	0.1	0.3	0.2	0.3	0.1

Determine which dominance, if any, is exerted by;

(i)Asset 2 over asset 3 [**5 Marks**]

(ii)Asset 3 over asset 1 [**5 Marks**]

(iii)Asset 1 over asset 2 [**5 Marks**]

QUESTION 3 [20 Marks]

A risk averse investor makes decisions using a quadratic utility function

$$U(w) = w + dw^2$$

(a)Derive an upper bound for d for this investor. [**5 Marks**]

(b)Explain why the investor can only use this utility function to make decisions over a limited range of wealth, w.Your answer should include a statement of this range. [**5 Marks**]

(c)The investor states that the upper limit of wealth where she can use this utility function is $w = Kshs.1,000$.Determine the value d in the investor's utility function. [**2 Marks**]

(d)The investor wins a price of Kshs.250 in a game show. She is then offered the opportunity to exchange this price for a larger price of Kshs.600 if she can answer one more question. However she will receive no price at all if she gets the question wrong. She estimates her chances of answering the question correctly to be 50%. Determine whether the investor should take this opportunity to exchange. [**8 Marks**]

QUESTION 4 [20 Marks]

In a market in which the Capital Asset Pricing Model(CAPM) holds,there are two securities with the following attributes (expressed per annum).

	Security	**A**	**B**
$E(r_i)$		0.196	0.164
$Cov(r_i, r_j)$	**A**	0.05	0.01
	B	0.01	0.03

(a) Determine the composition of the market portfolio with expected return of 18% per annum. [**6 Marks**]

(b) Calculate the beta of each security, under the assumption that the risk-free rate of interest is 10% per annum. [**6 Marks**]

(c)State the limitations of the CAPM. [**8 Marks**]

QUESTION 5[20 Marks]

(a) Define in the context of the mean-variance portfolio theory

(i)an inefficient portfolio [**2 Marks**]

(ii)an efficient portfolio [**2 Marks**]

(b) An investment universe includes two assets, A and B, with expected return on asset i of r_i and variance v_i as set out below:

Asset i	**Expected return** (r_i)	**Variance** (v_i)
A	$r_A = 0.05$	$v_A = 0.16$
B	$r_B = 0.07$	$v_B = 0.25$

The correlation of returns $c_{AB} = -0.2$. In an efficient portfolio, let a be the proportion which is held in asset A.

(i)Express the portfolio variance in terms of a quadratic function in a , showing your workings. **[5 Marks]**

(ii)Let R be the expected return on the portfolio. Express the portfolio variance in terms of a quadratic function in R, using your result in b(i) and showing your workings (Your expression should not include a).

[5 Marks]

(iii)The expression in (ii) above represents the efficient frontier. An investor uses the utility function that gives rise to an indifference curve

$$V = 16R - 200R^2$$

Determine the two portfolios on the efficient frontier that also lie on the investor's indifference curve. **[6 Marks]**