JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF BIOLOGICAL, PHYSICAL, MATHEMATICS AND ACTURIAL SCIENCES

UNIVERSITY EXAMINATION FOR BACHELOR OF ACTUARIAL SCIENCE

2023/24

MAIN REGULAR

COURSE CODE: WAB 2405

COURSE TITLE: Investment and Asset Management II

EXAM VENUE **STREAM: B.Sc. Actuarial Science**

DATE:…… **EXAM SESSION: ONE**

TIME: 2 HOURS

Instructions to the Candidate:

1. **Answer ONE and any other two 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 ONE: 30 MARKS

a. Explain the following as used in investment: [2 Marks]

i. Efficient Frontier
ii. Efficient Portfolio

b. Suppose that a market portfolio M is efficient, prove that an expected return $\bar{r}_i$ of any asset i satisfies the relation:

$$\bar{r}_i = r_f + \beta_i(\bar{r}_m - r_f)$$

Where r_f is risk free rate, β_i is beta of security i and $\bar{r}_m$ is expected market return.

[5 Marks]

c. JOOUST invested its funds in the following assets in Bondo with their respective returns and risk-free rate of 6%:

$Asset\ A$	$Asset\ B$	$Market$
10	6	9
12	7	8
−12	3	11
5	−2	10
8	12	6

Compute:

i. Beta for $Asset\ A$ and $Asset\ B$ [4 Marks]
ii. The Capital Market Line given A has 40% of the Portfolio [4 Marks]
iii. The Sharpe measure for each asset and rank them [4 Marks]

d. The Actuarial Society of JOOUST wanted to invest its savings in either Bunista SACCO or Equity Bondo with the following returns as shown below:

$Duration\ in\ Years$	0	1	2	3	4
$Bunista\ SACCO$	−1,000,000	650,000	30,000	300,000	100,000
$Equity\ Bank$	−1,000,000	350,000	350,000	350,000	350,000

The Actuarial Society has a weighted average cost of capital (WACC) of 12%.

i. Calculate the project's NPV and IRR [5 Marks]

ii. Which of the projects should be accepted if they are mutually exclusive [2 Marks]

e. Assume you are an investor and you would like to predict the expected return on a given security using Arbitrage Pricing Theory (APT) and you decide to use a two-factor model with the following estimates:

$\beta_o = 3.0\%$, $\beta_1 = 0.9\%$, $\beta_2 = 0.8\%$, $b_{i,1} = 0.5,\ b_{i,2} = 1.5$

i. Explain the meaning of $b_{i,2}$ being numerically greater than $b_{i,1}$ [2 Marks]

ii. Estimate the expected return on the security [2 Marks]

QUESTION 2: 20 Marks

a. Using the Mean Variance Portfolio Theory, prove that the efficient frontier becomes a straight line in the presence of a risk-free asset. [6 Marks]

b. Consider two independent assets M and N with expected returns of 12% and 22% per annum with a variance of 25% per annum and 100%% per annum respectively

i. If only asset M and N are available, calculate the equation of the efficient frontier in expected return standard deviation space [4 Marks]

ii. A third asset K which is risk free with expected return of 8% per annum was added. A Langragian function is to be used to calculate the equation of new efficient frontier. Write down the simultaneous equations that is anticipated and derive the relationship between X_M and X_N, the holding of asset M and N on a new efficient frontier. [6 Marks]

c. State and explain TWO assumptions of CAPM with their relevance in application [4 Marks]

QUESTION 3: 20 Marks

a. Distinguish between Systematic and Unsystematic Risk by giving examples

[4 Marks]

b. Given a Characteristic line:

$$r_{i,j} = a_i + b_i r_m + \varepsilon_t$$

Where a_i is alpha coefficient of security i with b_i as the beta coefficient. Partition the above characteristic line explicitly into systematic and unsystematic component based on the variance of return. [4 Marks]

c. The company X and Y had the following returns with their respective probabilities.

$Company\ X$	$Company\ Y$	$Probabilities$
10%	8%	0.2
−3%	−5%	0.4
12%	15%	0.4

i. Calculate the expected return of the portfolio with 60% of X and 40% of Y [4 Marks]

ii. Calculate the portfolio risk for the above portfolio [4 Marks]

d. Suppose that the rate of return of a market line has an expected value of 14% and standard deviation of 15%, let the risk-free rate be 10%. Using Capital Asset Pricing Formula, calculate the expected rate of return if the covariance is 0.045 [4 Marks]

QUESTION 4: 20 Marks

a. A Lecturer has just retired from JOOUST. He received $Ksh.\,1{,}000{,}000$ as retirement benefit and he intends to invest in a project that will preserve an accumulate his lifetime saving. The available investment project is expected to provide the following cashflows:

$Years$	$Expected\ Return\ of\ A$	$Expected\ Return\ of\ B$
0	900,000	600,000
1	200,000	300,000

2	300,000	200,000
3	400,000	250,000
4	350,000	150,000

The required rate of return of a lecturer is 4%

i. If the projects are mutually exclusive, calculate the NPV for each project and advise him accordingly. [6 Marks]

ii. Calculate the Profitability index for each project and advise him if the two investments are independent of each other? [3 Marks]

iii. Calculate the Payback Period for each Project [3 Marks]

b. Given:

	Company A	*Company B*
Expected Return	0.2	0.15
Total Risk	0.05	0.03
Beta Index	0.9	1.8

Find the coefficient of variation for Company A and B [6 Marks]

c. Explain two main factors that a company may use to determine the rate at which the proposal might be discounted and explain which of these factors would be most relevant. [2 Marks]

QUESTION 5: 20 Marks

a. You are a Consulting Actuary specializing in the Appraisal of the projects. JOOUST has approached you to examine one of its proposed projects. JOOUST is considering and investment of Ksh.800 million to develop a Scientific Research Laboratory in Some parts of Kenya which are not known for its political stability. From Technical point of view, the quality of the laboratory is excellent. Using the JOOUST technology, the services offered by the laboratory is 25% less than the current Kenyan Market price of the Service.

JOOUST has asked you to identify the risk facing the project and o suggest a method of risk analysis.

i. Describe the steps necessary to achieve an effective identification of risk facing the JOOUST project. [5 Marks]
ii. Describe briefly five major risks facing the project [5 Marks]

iii. Describe how the risk of the project can be analyzed [4 Marks]

iv. Explain THREE methods an Actuary would use to value individual projects [3 Marks]
v. Describe the Purpose of investment Trust, its Pricing, its Legal Structure and its operational basis. [3 Marks]