NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF ENGINEERING AND THE BUILT ENVIRONMENT

DEPARTMENT OF Civil, Mining and Process Engineering

QUALIFICATION : Bachelors of Engineering in Mining Engineering	
QUALIFICATION CODE: O8MEG	**LEVEL: 7**
COURSE CODE: MEF811S	**COURSE NAME: MINERAL ECONOMICS AND FINANCIAL VALUATION**
SESSION: JUNE 2023	**PAPER: THEORY**
DURATION: 3 HOURS	**MARKS: 100**

FIRST OPPORTUNITY QUESTION PAPER	
EXAMINER(S)	**Dr Lawrence Madziwa**
MODERATOR:	**Dr Victor Mutambo**

INSTRUCTIONS
1. Answer all questions. 2. Read all the questions carefully before answering. 3. Marks for each questions are indicated at the end of each question. 4. Please ensure that your writing is legible, neat and presentable.

PERMISSIBLE MATERIALS

1. Examination paper.

THIS QUESTION PAPER CONSISTS OF 4 PAGES (Including this front page)

1. A machine costing $42,000 will have a life of 5 years and a salvage value of $3,000. It is estimated that 10,000 units will be produced on this machine, distributed in this manner; $2000 in the first year, $2,400 in the second year, $2100 in the third year, $1800 in the fourth and $1700 in the firth year. If depreciation is allocated in the basis of production, calculate the depreciation charges of the three years. [6]

b. An asset costing $29,000 has a life expectancy of 5 years and an estimated salvage value of $3,500. Calculate the depreciation charges of the first two years applying first the declining balance method and the secondly the straight line method. [8]

2. The environmental rehabilitation costs required in 5 years' time for a small mining operation amount to R10 million. The mine needs to provide for this cost through an environmental rehabilitation sinking fund by putting away an equal amount every year into a safe sinking fund with a nominal interest rate of 8%. Determine the annual amount that must be invested every year and demonstrate by tabulating the sinking fund schedule that it indeed grows to the required R10 million. [10]

3. The orebody carries technical risk in terms of five main mining variables. Name them and explain how you will handle them in a cashflow. [10]

4. a. Discuss ten mining risks and possible mitigating actions normally used. [10]

b. Three investment alternatives shown in Table 1, have the following returns and probability of their returns. Using the coefficient of variation, rank the three alternatives from lowest risk to highest risk. [10]

Table 1: Cashflows of three different projects

Project A		Project B		Project C	
Cashflow	Probability of Cashflow	Cashflow	Probability of Cashflow	Cashflow	Probability of Cashflow
30	0.1	20	0.1	5	0.1
35	0.2	30	0.25	10	0.2
40	0.4	40	0.3	15	0.4
45	0.2	50	0.35	20	0.2
50	0.1	60	0.1	25	0.1

5. Name the three different mining costs and briefly discuss three ways in which they are estimated in feasibility studies. [6]

6. Mining is capital intensive business and capital is normally obtained from different sources. Name three main sources of capital and explain how the final cost is obtained. [10]

7. What are the factors that cause changes in supply and demand curves. [10]

8. A mine is considering two new investments for its ventilation system. Project C involves - the purchase of a coolant recovery system. Project H represents an investment in a heat recovery system. The firm wishes to use a net present value profile in comparing the projects. The investment and cash flow patterns are presented in Table 2 as follows:

Table 2: Cashflow of two projects

Project Alternatives	Years				
	0	1	2	3	4
Project C	-25,000	6,000	7,000	9,000	13,000
Project H	-25,000	20,000	6,000	5,000	

a. Determine the net present value of the projects based on a zero-discount rate and comment on your answer. [5]

b. Determine the net present value of the projects based on a 9 percent discount rate. [5]

c. Determine the internal rate of return on Project C and H. Use a Graph to present a net present value profile for the two investments. (Use a scale up to $10,000 on the vertical axis, with $2,000 increments. Use a scale up to 20 percent on the horizontal axis, with 5 percent increments.) Also discuss with the help of a diagram the different conditions under which you will select the different projects. [10]

(End of Exam)

FORMULAE LIST

FV = $PV\,(e)^{rt}$

FV = $PV(1+i)^n$

PV = $FV\left[\frac{1}{(1+i)^n}\right]$

FV = $A\left[\frac{(1+i)^n - 1}{i}\right]$

PVA = $A\left[\frac{(1+i)^n - 1}{i(1+i)^n}\right]$

A = $FVA\left[\frac{i}{(1+i)^n - 1}\right] = PVA\left[\frac{i(1+i)^n}{(1+i)^n - 1}\right]$

BEV = $\frac{TFC}{UR - UVC}$

TR = $UR * V$

TC = $TFC + UVC$

$\mathbf{R_e} = R_f + \beta\,(R_m - R_f)$

EVA = [NOPAT – Cost of Capital * Invested Capital]

PV Ratio = PV of returns / PV of investments

PI Ratio = PV Ratio – 1

Current Ratio = current assets / current liabilities

Total Debt Ratio = total debt / total assets

Debt to Equity Ratio = total debt / total equity

Net Profit Margin = Profit after interest and tax / sales

Return on Equity = profit after tax / shareholders' equity