



**FACULTY OF ENGINEERING AND THE ENVIRONMENT  
DEPARTMENT OF MINING ENGINEERING**

**EMI 5103 – FINANCIAL VALUATION  
Examination Paper September 2024**

Time Allowed: **3 hours**

Total Marks: **100**

Examiner's Name: **MANESWA G**

**Additional Requirements**

- Calculator

**INSTRUCTIONS:**

1. This paper contains **TWO** sections
2. Answer all questions in Section **A** and any **3** questions in Section **B**.
3. Show all your working for full credit.
4. Start each question on a new page.

This examination paper consists of **4** pages

**Section A [40 marks]**  
**Answer all questions**

**Question One**

**a. Short Answer Questions**

- i. Define mineral resource and explain the difference between mineral resource and mineral reserve. **[4 marks]**
- ii. Describe the role of geological, engineering, economic, and environmental factors in the estimation of mineral resources. **[4 marks]**
- iii. What are the key parameters used in the discounted cash flow (DCF) method for mineral asset valuation? **[4 marks]**
- iv. Explain the concept of Net Present Value (NPV) and its significance in mineral asset valuation. **[4 marks]**
- v. Briefly discuss two limitations of the comparable transactions method for mineral asset valuation. **[4 marks]**

**b.** A mineral exploration company has identified a new copper deposit. The deposit is estimated to contain 1 million tonnes of ore with an average grade of 2.5% copper. The operating costs are estimated to be \$50 per tonne of ore, and the capital expenditure for developing the mine is \$100 million. The current market price of copper is \$8,000 per tonne.

- i. Using the discounted cash flow (DCF) method, calculate the net present value (NPV) of the deposit assuming a discount rate of 12% and a mine life of 10 years. **[10 marks]**
- ii. Determine the breakeven copper price required to achieve an NPV of \$0. **[5 marks]**
- iii. Discuss the key factors that could impact the valuation of this mineral deposit. **[5 marks]**

**Section B [60 marks]**  
**Answer any 3 Questions**

**Question Two**

**a.** The following data is provided for a mineral deposit:

- Proven and Probable Reserves: 50 million tonnes
- Average Grade: 2.5 g/t gold
- Metallurgical Recovery: 90%
- Operating Costs: \$30/t milled
- Capital Costs: \$250 million
- Discount Rate: 10%
- Commodity Price: \$1,800/oz gold

Calculate the Net Present Value (NPV) of the mineral asset using the discounted cash flow (DCF) method. Assume a mine life of 10 years and steady-state production. **[10 marks]**

**b.** An exploration company has identified a new mineral deposit with the following characteristics:

- Inferred Resources: 30 million tonnes
- Average Grade: 1.8% copper
- Metallurgical Recovery: 85%
- Operating Costs: \$25/t milled
- Capital Costs: \$180 million
- Discount Rate: 12%
- Commodity Price: \$7,000/t copper

Estimate the in-situ value of the mineral deposit using the Kilburn method. **[10 marks]**

**Question Three**

- a.** You have been tasked to evaluate the mineral asset valuation of a gold mining company. Discuss the key factors you would consider in your analysis and the potential challenges you might face. **[10 marks]**
- b.** Explain the concept of risk and uncertainty in mineral asset valuation. Discuss two methods that can be used to account for risk in the valuation process. **[10 marks]**

#### **Question Four**

The GDR Mining Company is considering the acquisition of a copper-gold deposit located in a remote region. The following information is provided:

- Proven and Probable Reserves: 80 million tonnes
- Average Grade: 0.8% copper, 0.5 g/t gold
- Metallurgical Recovery: 88% for copper, 85% for gold
- Operating Costs: \$40/t milled
- Capital Costs: \$450 million
- Discount Rate: 8%
- Commodity Prices: \$9,000/t copper, \$1,900/oz gold

Based on the given information, perform a comprehensive mineral asset valuation for the GDR Mining Company. Discuss your assumptions, methodology, and the key findings of your analysis. **[20 marks]**

#### **Question Five**

A mining company is considering the acquisition of a gold deposit. The deposit is estimated to contain 50,000 ounces of gold with an average grade of 5 g/t. The initial capital expenditure is \$20 million, and the operating costs are estimated to be \$800 per ounce of gold produced.

- a. Using the comparable transaction method, determine the market value of the gold deposit if recent transactions in the region have been at \$50 per ounce of gold in the ground. **[12 marks]**
- b. Discuss the key factors that the mining company should consider in addition to the valuation when making the acquisition decision. **[8 marks]**

***Bon Courage!!!***