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#### MANICALAND STATE UNIVERSITY OF APPLIED SCIENCES

FACULTY OF ENGINEERING, APPLIED SCIENCES AND TECHNOLOGY

**DEPARTMENT: MINING AND MINERAL PROCESSING ENGINEERING**

**MODULE: ENGINEERING ECONOMICS**

**CODE: ENGP313**

### SESSIONAL EXAMINATIONS

**JUNE 2023**

**DURATION: 3 HOURS**

**EXAMINER: MR MUTIZHE**

## INSTRUCTIONS

1. *Answer* ***all*** *questions in Section A and any three(3) questions from section B*
2. *Each question carries 20 marks*
3. *The paper consist of 6 printed pages*
4. *Total marks 100*

***Additional material(s):*** *pen, pencil*

**Section A**

**Question 1**

1. State two source finance investments in mining projects and give 2 advantages and disadvantage of each source of finance. **[6]**
2. Briefly explain two methods used in cost estimation **[6]**
3. A miner needs to make the following payments against a loan on his lorry as follows $20 000 after 6 months, $ 30 000 after 8 months $45 000 due after 3 years. He fails to pay, then after 15 months he manages to pay $40 000. What single payment should he make 3 years from now to settle the debt if simple interest of 15% is charged on all amounts? **[5]**
4. Suppose you deposit $1,000 in an account pays simple interest. What will be the future value of the account if: 5% for the first 10 years, 10% for the next 10 years, 15% for the last 10 years? **[3]**

**Question 2**

Freshstage mine intent to invest in the following mining projects with initial investment of $ 2 000 000 dollars and projects are expected to generate the following cashflow in table 1

|  |  |  |
| --- | --- | --- |
| ***Cash Flows*** | ***Project A*** | ***Project B*** |
| ***Year one*** | $500,000 | $600,000 |
| ***Year two*** | $500,000 | $600,000 |
| ***Year three*** | $500,000 | $600,000 |
| ***Year four*** | $500,000 | $600,000 |
| ***Year five*** | $500,000 | $600,000 |
| ***Discount Rate*** | 6% | 9% |

1. Calculate
2. Pay back periods of the projects **[4]**
3. Net present Value projects **[6]**
4. Internal rate of return **[8]**
5. Comment on the project which Freshstage should select **[2]**

**Section B**

**Question 3**

1. Briefly discuss four stages involved in project management. In answer include an example of a project. **[12]**
2. Briefly discuss project control techniques which are used in mining projects **[8]**

**Question 4**

1. Briefly discuss importance of financial ratios **[4]**
2. Briefly explain the importance of the following financial ratios in projects
3. Liquidity ratios
4. Leverage ratios
5. Efficiency ratios
6. Profitability ratios **[4]**
7. Perth mining company operates two mines for the purpose of extracting gold and silver. The Saddle Mine costs $14,000/day to operate, and yields 50 oz of gold and 3000 oz of silver each day. The Horseshoe Mine costs $16,000/day to operate, and yields 75 oz of gold and 1000 oz of silver each day. Company management has set a target of at least 750 oz of gold and 24,000 oz of silver. How many days should each mine be operated so that the target can be met at a minimum cost to the company? What is the minimum cost? **[12]**

**Questions 5**

1. State and explain risk associated with mining projects in Zimbabwe **[6]**
2. Discuss how the following methods are used in risk analysis in mining projects
3. Sensitivity **[4]**
4. Scenario analysis **[4]**
5. Briefly discuss real option used to hedge mining projects **[6]**

**Question 6**

Freshstage Mine has produced the following network diagram for a mining project. Freshstage has specified the duration for each activity in Table 2 below, and has asked you to complete the table and network diagram by doing the following:

Table 2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Activity  | predecessor | duration | ES | EF | LS | LF | Foat |
| A | 4 |  |  |  |  |  |  |
| B | 6 | A |  |  |  |  |  |
| C | 5 | A |  |  |  |  |  |
| D | 6 | A |  |  |  |  |  |
| E | 4 | B |  |  |  |  |  |
| F | 6 | C |  |  |  |  |  |
| G | 7 | D |  |  |  |  |  |
| H | 5 | G |  |  |  |  |  |
| I | 3 | E,F,H |  |  |  |  |  |
| J | 3 | I |  |  |  |  |  |

1. Draw the Gantt Chart for the project. **[6]**
2. Draw the Network diagram **[3]**
3. Calculate the Early start, Early Finish, Last Start, Late finish and the float or slack associated with each activity. **[9]**

b. Identify the critical path for Alex's network diagram. **[2]**

**Question 7**

Discuss the tools and techniques that project managers can use to ensure knowledge and lessons learned from previous projects are not lost, and can be shared for the benefit of future projects. [**20]**