DEPARTMENT OF MINERALS AND ENERGY
MINE MANAGER'S EXAMINATION

METAL MINING I
MINING

DATE:	**13 MAY 2008**	**TOTAL MARKS:**	**100**
TIME ALLOWED:	**3 HOURS (08:30 – 11:30)**	**TO PASS:**	**50%**

NOTE: **Answer all the questions**

- **All answers and sketches to be presented in a neat and decipherable manner. Papers will not be marked if not decipherable.**
- **Restrict the use of highlighters.**
- **Do not use a red pen.**
- **Read the instructions on the front page of your answer book carefully.**
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MIN. 1 MAY 2008

QUESTION 1

You have lost your reef ore PASS due to excessive scaling. The area is between shaft loading box and the level directly above. This is your only hoisting shaft. You have a waste pass that is currently working. Bottom of the shaft is 2 500m deep. The dip of the reef pass is 70° and was conventionally mined. Vertical distance between levels is 55m. 10% of total rock hoisted is waste.

How will you go about the following?

1.1	Assessing the damage caused by scaling.	(5)
1.2	Plan of action to mitigate loss of reef ore pass	(5)
1.3	Awarding a contract to repair the ore pass	(5)
1.4	Set up a project team to assist the appointed business partners	(5)

[20]

QUESTION 2

Your shaft has been closed due to series of serious incidents involving falls of ground. You have been issued a Section 54 Order because of the accident rate.

What are you going to do to:

2.1	Get the Section 54 Order lifted	(10)
2.3	Put a short term and long term plan in place to reduce fall of ground incidents	(10)

[20]

QUESTION 3

You are given a block of ground to mine in a deep level trackless environment.
What factors would you consider in mining this ground safely and economically?

Dip of reef	18°	Shaft hoisting capacity 200 000 tons per month
Stope width	9 metres	
Area to be mined	350 000 m^2	
Grade	10 g/t	
Intake temperature	dry bulb 32°C wet bulb 30°C	
Distance to station	1500 metres	
Depth below surface	3000 metres	

[40]

QUESTION 4

What are the points to consider when choosing a rock surface support in development ends at a depth of 800 metres. **[20]**

TOTAL MARKS: [100]

the dme

Department:
Minerals and Energy
REPUBLIC OF SOUTH AFRICA

MINE MANAGERS EXAMINATION

METAL MINING
MINING 1

DATE: 14 OCTOBER 2008

TOTAL MARKS: 100
TO PASS: 50

TIME ALLOWED: 3 HOURS
(08h30 - 11h30)

NOTE: Answer all the questions

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QUESTION 1

Given the following information, what are the points to consider when designing a gold mine safely and economically? Show clear sketches on positioning. Shafts, haulages, cross-cuts and show what type of shaft configuration would be suitable.

Sub-outcrop against Dolomites	1 500 metres below surface
Dip of the reef	40 degrees
Size of block	2 000 metres on strike and 500 metres on dip
Reef width	1, 20 metres
Footwall	Competent
Institu grade	15 grams per ton
Mine call factor	85 percent
Geological losses	15 percent
Gold price	$850 per ounce

[40]

QUESTION 2

What are the definitions of the following terms?

2.1	Stress	(2)
2.2	Strain	(2)
2.3	Primitive stress or virgin stress	(2)
2.4	Critical span	(2)
2.5	Induced stress	(2)
2.6	Field stress	(2)
2.7	Convergence	(2)
2.8	Young's modulus	(2)
2.9	Poisson's ratio	(2)
2.10	Fracture zone	(2)

[20]

QUESTION 3

What are the factors to consider when ordering a new fleet of trackless mechanized mining equipment for a narrow tabular platinum ore body? (Less than 2m stope width)

[20]

QUESTION 4

What are the twenty (20) most important factors to consider in the design and choice of a support system at a conventional platinum mine which is 700 metres deep and mined at a 1 metre stope width.

[20]

TOTAL [100]

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MINE MANAGER'S EXAMINATION

METAL MINING
MINING 1

DATE: 12 MAY 2009

TOTAL MARKS: 100
TO PASS: 50

TIME ALLOWED: 3 HOURS
(08h30 - 11h30)

NOTE: Answer all the questions

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QUESTION 1

Your vision as the manager of a mine is to be globally competitive in terms of cost effectiveness. By making use of suitable examples, briefly discuss the possible effects on the cost effectiveness of any mining operation through the utilization of:

1.1	Remote control and automation of equipment	(4)
1.2	Technology versus labour	(4)
1.3	Non-explosive rock breaking	(4)
1.4	Effective communication and information sharing	(4)
1.5	HIV/AIDS policy and programs	(4)

[20]

QUESTION 2

As the manager of a mine, you have to make a recommendation to your board of directors regarding the economic viability of opening up and mining a new underground area. This area is accessible from an existing mining area.

The following information could be relevant.

- Strike length 2000 metres
- Dip length 1000 metres
- Dip 15 degrees
- Relative density of ore 2,75 t/m^3
- Stoping width 150 cm
- Product price R250 000/kg
- Working cost R1 050 / tonne
- Ore grade 15 g/t
- Plant efficiency 97%
- MCF 90%
- Capital cost R150 / tonne milled
- Tax 25%

2.1	Calculate the total milled tonnes if the total area is mined out	(5)
2.2	Calculate the total revenue	(5)
2.3	Calculate the capital cost	(5)
2.4	Calculate the total profit after capital cost and before tax	(5)
2.5	Calculate total profit after tax	(5)

[25]

QUESTION 3

With the aid of sketches and an explanation, give a concise description of a block caving operation under the following headings:

3.1	Development	(5)
3.2	Production	(5)
3.3	Cave dynamics	(5)
3.4	Application	(5)

[20]

QUESTION 4

Design a trackless mining layout in an ore-body with a channel width of 1,5m, a dip of 12° at a depth of 1500 m. The host rock has a uniaxial compressive strength of 180 MPa. The run of mine production should be 100 000 tons per month and section productivity more than 300 tons / person / month.

Use the following headings in your answer:

4.1	Panel layout	(5)
4.2	Suite of equipment / section	(5)
4.3	Labour compliment / section	(5)
4.4	Support design	(5)
4.5	Ventilation design	(5)
4.6	Planned maintenance system	(5)
4.7	Organisational structure	(5)

[35]

TOTAL [100]

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MINE MANAGER'S EXAMINATION

METAL MINING
MINING 1

DATE: 20 OCTOBER 2009

TOTAL MARKS: 100
TO PASS: 50

TIME ALLOWED: 3 HOURS
(08h30 - 11h30)

NOTE: Answer all the questions

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QUESTION 1

An ore body at a depth of 2 500 metres below surface with an average width of 200cm must be mined. The value of the ore body is 1 400 cmg/t.

The ore body dips at 15° and is 2 000 metres on strike and 1 000 metres on dip. A rate of 150 000 reef tonnes per month will be mined

You have been given the task of completing a feasibility study on the most efficient and safest mining extraction method. You have been asked to consider both a conventional and a trackless mining method.

Considering both mining methods give your conclusions and recommendations to the following. Include sketches where necessary.

Show all assumptions

1.1	Development layout	(5)
1.2	Stoping layout	(5)
1.3	Ventilation for development and stoping horizons	(5)
1.4	Ore passes from footwall development to reef horizon	(5)
1.5	Primary support in footwall development	(5)
1.6	Support on reef elevation, both local and regional	(5)
1.7	Type of equipment both for trackless and conventional	(5)
1.8	Labour requirements for the 150 000 tonnes per month in stope only	(5)

(40)

QUESTION 2

Consider how you would change an open pit Platinum mine to an underground operation under the following headings.

Show all assumptions

2.1	Shaft system and major tunnels	(5)
2.2	Mining method	(5)
2.3	Ventilation	(5)
2.4	Broken rock handling	(5)
2.5	Safety	(5)

(25)

QUESTION 3

Discuss vertical shaft sinking under the following headings

3.1	Collar construction and pre-sink	(5)
3.2	Sinking	(5)
3.3	Cover drilling	(5)
3.4	Lining	(5)
3.5	Station construction and initial development	(5)
3.6	Equipping	(5)
3.7	Safety	(5)
		(35)

TOTAL (100)

mineral resources
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Mineral Resources
REPUBLIC OF SOUTH AFRICA

MINE MANAGER'S EXAMINATION

METALLIFEROUS MINING

MINING 1 (METAL)

DATE: 11 MAY 2010

TOTAL MARKS: 100
TO PASS: 50

TIME ALLOWED: 3 HOURS
(08h30 to 11h30)

NOTE:

Answer all questions

- This paper consists of **THREE** pages.
- All answers and sketches to be presented in a neat and decipherable manner.
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QUESTION 1

An ore body sub outcrops at a depth of 250 metres below surface with an average reef width of 100cms. The value of the ore body is 550 cmg/t. Au.

The ore body dips at 15° and is 3 500 metres on strike and 1 500 metres on dip. A build up to 170 000 reef tonnes per month will be the final mine capacity.

You have been given the task of completing a feasibility study on the most efficient and safest mining extraction method. You have been asked to consider a trackless mining method.

Give your conclusions and recommendations to the following. Include sketches where necessary.

Show all assumptions

1.1	Surface layout which will include a decline	(5)
1.2	Development layout with second escape way back to surface	(5)
1.3	Stoping layout	(5)
1.4	Ventilation for development and stoping horizons	(5)
1.5	Primary & secondary support in trackless development	(5)
1.6	Transportation and hoisting of the reef out of the mine	(5)
1.7	Type of equipment for trackless	(5)
1.8	Labour requirements for the mine on a trackless operation	(5)

[40]

QUESTION 2

Five different methods of investment appraisal are commonly used. These are:

2.1	Payback period	(5)
2.2	Net present value	(5)
2.3	Internal rate of return	(5)
2.4	Equivalent annual cost	(5)
2.5	External rate of return	(5)

Give an explanation of each one and show examples

[25]

QUESTION 3

What are the points to consider when mining an opencast and an open pit platinum mine in a rural area of South Africa?

[35]

TOTAL [100]

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REPUBLIC OF SOUTH AFRICA

MINE MANAGER'S CERTIFICATE OF COMPETENCY EXAMINATION

METALLIFEROUS MINING
MINING 1 (METAL)

DATE: 19 OCTOBER 2010

TOTAL MARKS: 100
TO PASS: 50

TIME ALLOWED: 3 HOURS
(08h30 to 11h30)

NOTE:

- This question paper consists of **three** pages
- Answer all the questions.
- All answers and sketches to be presented in a neat and decipherable manner.
  Papers will not be marked if not decipherable.
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- Read the instructions on the front page of your answer book carefully.
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QUESTION 1

Discuss vertical shaft sinking under the following headings

1.1	Collar construction and pre-sink	(5)
1.2	Sinking	(7)
1.3	Cover drilling	(3)
1.4	Lining	(5)
1.5	Station construction and initial development	(5)
1.6	Equipping	(5)
1.7	Shaft and bank safety	(5)

[35]

QUESTION 2

In an effort to improve productivity at the work face, discuss in detail a gold mine which is a 3000m deep conventional mine.

2.1	Labour structure at the work face	(5)
2.2	Stoping and developing work cycles	(5)
2.3	Supervisory structures and reporting systems	(5)
2.4	Incentive schemes	(5)
2.5	Personnel selection criteria	(5)

[25]

QUESTION 3

Describe the points to consider in closing a mine and related infra-structure.

[20]

QUESTION 4

Describe the following technologies:

4.1	Go-belt sampling – installation to getting samples to the laboratory	(5)
4.2	Drop raising – survey layouts to drilling and blasting	(5)
4.3	Non-explosive mining – underground applications	(5)
4.4	Emulsion explosives- from surface to the face underground	(5)

[20]

TOTAL MARKS: 100

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Mineral Resources
REPUBLIC OF SOUTH AFRICA

MINE MANAGER'S CERTIFICATE OF COMPETENCY EXAMINATION

METALLIFEROUS MINING
MINING 1 (METAL)

DATE: 10 MAY 2011

TOTAL MARKS: 100
TO PASS: 50

TIME ALLOWED: 3 HOURS
(08h30 to 11h30)

NOTE:

- This question paper consists of **three** pages including cover page.
- Answer all the questions.
- All answers and sketches to be presented in a neat and decipherable manner. Papers will not be marked if not decipherable.
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QUESTION 1

What precautions must be taken to prevent fires and to reduce the risk of persons being exposed to fumes or accidents in an underground mechanized mining section? Answer your questions under the following headings.

1.1	Oil and grease stores	(5)
1.2	Engineering workshops and stores	(5)
1.3	Fuel bays and supply of fuel	(5)
1.4	Trackless machinery	(5)
1.5	Tyre store	(5)
		(25)

QUESTION 2

Productivity in recent years has become a major feature in the mining industry. To improve productivity and to save costs many developments and improved techniques have taken place and materialized.
Write short notes on these recent developments and techniques under the following headings.

2.1	Shaft sinking	(5)
2.2	Haulage development	(5)
2.3	Stoping narrow reef 1m to 2m	(5)
2.4	Stoping wide reefs 2m to 25m	(5)
2.5	Participative management	(5)
		(25)

QUESTION 3

Describe under the following headings what mining method could be employed to mine an orebody varying between 3m and 15m wide. The orebody has an average dip of 2° to 5°, with an average value 4 to 6 g/t.

The mining depth is 2500m

3.1	Write down all assumptions and the reasons therefore.	(5)
3.2	Primary development	(5)
3.3	Secondary development on reef	(5)
3.4	Stoping of the orebody	(5)
3.5	Drilling and blasting	(5)
3.6	Cleaning	(5)
3.7	Selection of equipment	(5)
3.8	Equipment performance expected	(5)
3.9	Maintenance systems for all equipment	(5)
3.10	Labour structure and efficiencies	(5)

(50)

TOTAL (100)

mineral resources
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REPUBLIC OF SOUTH AFRICA

MINE MANAGER'S CERTIFICATE OF COMPETENCY EXAMINATION

METALLIFEROUS MINING
MINING 1

DATE: 18 OCTOBER 2011

TOTAL MARKS: 100
TO PASS: 50

TIME ALLOWED: 3 HOURS
(08h30 to 11h30)

NOTE:

- This question paper consists of TWO pages including cover page.
- Answer all the questions.
- All answers and sketches to be presented in a neat and decipherable manner.
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QUESTION 1

With the aid of sketches describe Sublevel stoping **or** Block caving.

1.1	General description	(5)
1.2	Application	(5)
1.3	Layout	(5)

Describe the **technical** requirements with respect to:

1.4	Mining sequence	(5)
1.5	Development	(5)
1.6	Drilling, blasting and explosives	(5)
1.7	Cleaning and loading	(5)
1.8	Ventilation	(5)

[40]

QUESTION 2

Consider how you would change an open pit mining operation of a large Platinum Mine to an underground operation under the following headings:

2.1	Write down all assumptions and the reasons therefore	(5)
2.2	Safety	(5)
2.3	Mining method	(10)
2.4	Ventilation	(5)
2.5	Rock handling	(5)
2.6	Support	(5)

[35]

QUESTION 3

What are the points to consider when choosing a rock surface support in development ends at a depth of 800 metres. **[25]**

TOTAL MARKS: 100

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Mineral Resources
REPUBLIC OF SOUTH AFRICA

MINE MANAGER'S CERTIFICATE OF COMPETENCY EXAMINATION

MINING 1

METALLIFEROUS MINING

DATE: 08 MAY 2012

TOTAL MARKS: 100

TO PASS: 50

TIME ALLOWED: 3 HOURS

(08h30 to 11h30)

NOTE:

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QUESTION 1

Geological information and details of a large platinum bearing resource.

- Characteristic and nature of ore body: Tabular.
- Area of resource: 6 000m X 6 000m.
- Depth of ore body: 600m – 800m below surface.
- Average dip of ore body: 0-4 degrees.
- Resource width of 70% of area: > 2 metre.
- Resource width of 30% of area: < 1 metre.
- Density of ore body: 2.8 t/m³.
- Rock characteristics @ 200m below collar: Water bearing fissures of ± 30 000 litre per hour.
- General rock mass rating from surface to 600m below surface: Average to poor.
- Immediate handing wall above reef: Fair to good.

Surface foot print details:

- Residential community: 1 000m from planned shaft position.
- River runs across the surface lease area.

Design and establish a fully operational mine under the following headings.

1.1 Surface infrastructure. (2)
1.2 Access to the Ore body. (3)
1.3 Creating stations and life of mine infrastructure underground. (5)
1.4 Mine design criteria, including mining method(s). (10)
1.5 Equipment and selection, procurement and maintenance philosophy. (10)
1.6 Recruitment, selection, placement and training of maintenance and operating personnel. (5)
[35]

QUESTION 2

Describe the following technologies.

2.1 Go-belt sampling – installation to getting samples to the laboratory. (5)
2.2 Drop raising – survey layouts to drilling and blasting. (5)
2.3 Emulsion explosives – from surface to the face underground. (5)
[15]

QUESTION 3

A large mining project with a planned mining rate of 200 000 tons per month will require a tailings dam. The estimate yield of platinum group of metals is 5g\ton mined and processed through the metallurgical plant. Use to following headings to discuss:-

3.1 The process followed in securing surface land for the establishment of a tailings dam. (5)

3.2 Design, construction and maintenance of the tailings dam. (5)

3.3 Environmental and pollution aspects pertaining to such a facility in close proximity of residential areas. (5)

[15]

QUESTION 4

A study of a large underground mine is being conducted. The surface infrastructure will most probably be closely situated to the community and on communal land. In order to finalize the feasibility study it is of vital importance that all stakeholder issues are addressed.

Discuss under the following headings: -

4.1 The impact on houses and dwellings due to the planned mining activities. (2)

4.2 Employment of local labour. (3)

4.3 Statutory and legal compliance issues and how are they addressed and implemented. (10)

4.4 Soil management, biodiversity and environment management systems. (3)

4.5 Closure of mine and rehabilitation. (2)

[20]

QUESTION 5

Using the information in table 1 below for a simplified shaft sinking and mining project, give an explanation of each of the appraisal methods, and calculate the answer to each method using a discount rate of 10% where applicable.

5.1 Payback Method (5)

5.2 Net present value (NPV) (5)

5.3 Internal Rate of return (IRR) (5)

TABLE 1:

Year	Sinking Cost	Mining Cost	Concentrating cost	Overhead Cost	Revenue
1	50,000,000	-	-	-	-
2	100,000,000	-	-	-	-
3	150,000,000	-	-	-	-
4	200,000,000	-	-	-	-
5	250,000,000	-	-	-	-
6	300,000,000	-	-	-	-
7	200,000,000	-	-	-	-
8	100,000,000	420,000,000	78,000,000	49,800,000	781,200,000
9	40,000,000	840,000,000	156,000,000	99,600,000	1,562,400,000
10	10,000,000	1,260,000,000	234,000,000	149,400,000	2,343,600,000
11	-	1,680,000,000	312,000,000	199,200,000	3,124,800,000
12	-	2,100,000,000	390,000,000	249,000,000	3,906,000,000
13	-	2,100,000,000	390,000,000	249,000,000	3,906,000,000
14	-	2,100,000,000	390,000,000	249,000,000	3,906,000,000
15	-	2,100,000,000	390,000,000	249,000,000	3,906,000,000
16	-	2,100,000,000	390,000,000	249,000,000	3,906,000,000
17	-	2,100,000,000	390,000,000	249,000,000	3,906,000,000
18	-	2,100,000,000	390,000,000	249,000,000	3,906,000,000
19	-	2,100,000,000	390,000,000	249,000,000	3,906,000,000
20	-	2,100,000,000	390,000,000	249,000,000	3,906,000,000
	1,400,000,000	23,100,000,000	4,290,000,000	2,739,000,000	42,966,000,000

[15]

TOTAL MARKS: [100]

mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

MINE MANAGER'S CERTIFICATE OF COMPETENCY EXAMINATION

MINING 1

METALLIFEROUS MINING

DATE: 16 OCTOBER 2012

TOTAL MARKS: 100

TO PASS: 50

TIME ALLOWED: 3 HOURS

(08h30 to 11h30)

NOTE:

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QUESTION 1

GEOLOGICAL INFORMATION REGARDING A NEW 200 000 TONS PER MONTH UNDERGROUND MINE TO BE ESTABLISHED.

- The Platinum Group Metals (PGM) ore body outcrops on surface.
- Strike length of ore body: ±10 km.
- Dip length of ore body: ± 6 km.
- Average Dip of ore body: 10 Degrees.
- Resource width of ore body: 1 metre.
- Density of ore body rock: 3 t/m^3.
- The average grade of the ore body presents a feasible underground mine.

ADDITIONAL AND GENERAL INFORMATION:

- The first 40 meters below surface along the whole strike length have been mined as an open cast operation.
- The area excavated has been back filled except for 2 areas still being mined and not back filled yet and rehabilitated.
- The aforementioned 2 areas are located 2.5 km and 3.0 km away from the centre of the 10 km strike length.
- The mine must be at a steady state within 5 years.

List briefly all possible methods available and decide on the most optimum and suitable method in establishing a fully operational mine. Once a preferred method has been selected discuss it in more detail. **NB!! This must be done for all questions 1.1, 1.2.1, 1.2.2, 1.2.3, 1.3.**

1.1 Accessing the ore body from surface (8)

1.2 Creating life of mine infrastructure with particular reference to:

1.2.1 Lowering and hoisting of men and material. (4)

1.2.2 Hoisting of Rock (Waste & Reef) & water handling. (4)

1.2.3 Ventilating the mine, fire prevention and monitoring. (4)

1.3 Mining method, layouts and designs for rock engineering principles. (10)

[30]

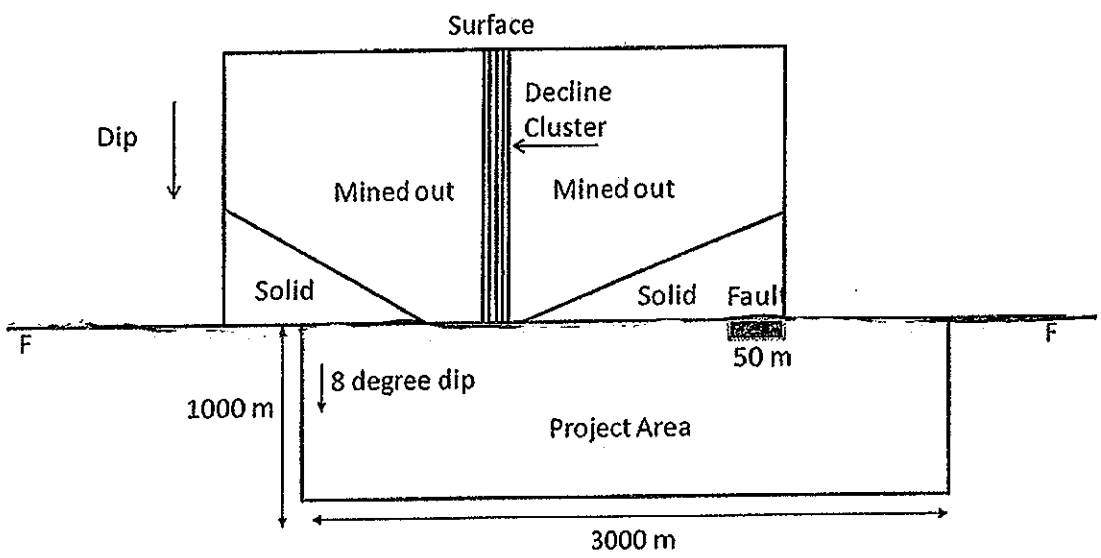
QUESTION 2

A 100 000 Ton per month precious metal shaft is approaching its mining limit on dip and strike and requires replacement ore reserves. The current infrastructure cannot be utilized to access a feasible block of ground to maintain current production levels. A possible resource exists down dip of the existing shaft.

DETAILS OF PROJECT AREA:

- Strike Length : 3 km
- Dip length : 1 km
- Average Dip : 8 Degrees
- Resource width : 1 m

Sketch and Orientation of Project Area (NTS)



DETAILS OF EXISTING SHAFT:

- Conventional scattered breast mining with footwall haulages and cross-cuts to reef.
- Track bound haulages equipped with locomotives and hoppers.
- 30 m panels are drilled (1.0 m), blasted and scraper cleaned into stope ore passes, then trammed to station ore passes feeding the main decline conveyors.
- Main support is in-situ pillars with elongate timber support.
- Access to area through an existing 3 cluster system i.e. material decline, chairlift and conveyor belt system.
- Ventilation is through worked out areas and upcast shafts.

DESIGN THE FUTURE SHAFT UNDER THE FOLLOWING HEADINGS:

2.1 Access to the replacement ore body. (5)
2.2 Mining method. (5)
2.3 Ventilation or refrigeration requirements. (5)
2.4 Hoisting of rock, and transportation of rock and material. (5)

[20]

QUESTION 3

Underground narrow ore bodies are exploited by drilling shot holes, charging them with explosives and blasting. Discuss the following technologies for drilling shot holes, and also the advantages and disadvantages of each.

3.1 Pneumatic drilling. (4)
3.2 Electric drilling. (4)
3.3 Hydraulic drilling. (4)
3.4 Hydro-powered drilling sourced from potential energy. (4)
3.5 Hydro-powered drilling sourced from electrically driven power packs in close proximity of the workings. (4)

[20]

QUESTION 4

A large mine producing tailings at a rate of 200 000 tons per month for 20 years has catastrophically failed. As the appointed Manager discuss under the following headings how you would conduct your investigation into the causes of the failure:

4.1 The design and construction of the tailings dam. (5)
4.2 The maintenance of the tailings dam. (5)
4.3 The methodology, policies and procedures followed in the disposal of tailings to and onto the dam. (5)

[15]

QUESTION 5

A Mine is considering the purchase of a monitoring devices for its underground loco's that will cost R 3 170 000 for initial installation. The devices will be useable for 4 years after which they will have no salvage value. The devices will however increase net cash inflows by R 1 500 000 per year due to efficiency improvements, but have additional maintenance cost of R 250 000 per year and additional overhead cost allocation of R 50 000 per year. The board of directors requires a 10% rate of return on such investments

Different methods of investment appraisal are used in evaluating such capital projects, most common being the following:

- Payback Method
- Net present value (NPV)
- Internal Rate of return (IRR)

Using the information in the table below, supply the following

5.1 Definition of each of the three (3) methods listed above. (6)
5.2 Calculate the answer to each method listed above, ignoring tax implications, and using the DCF table supplied. (9)

Project Cash Flow schedule

Year	Monitoring Devices	Efficiency	Maintenance	Overhead Cost
0	-3 170 000	-	-	-
1	-	1 500 000	-250 000	-50 000
2	-	1 500 000	-250 000	-50 000
3	-	1 500 000	-250 000	-50 000
4	-	1 500 000	-250 000	-50 000

DCF Table

Periods	10%	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0.909	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	1.736	1.713	1.690	1.668	1.647	1.626	1.605	1.585	1.566	1.547	1.528
3	2.487	2.444	2.402	2.361	2.322	2.283	2.246	2.210	2.174	2.140	2.106
4	3.170	3.102	3.037	2.974	2.914	2.855	2.798	2.743	2.690	2.639	2.589

[15]

TOTAL MARKS: [100]