



**FACULTY OF ENGINEERING AND ENVIRONMENT
DEPARTMENT OF MINING ENGINEERING
COMPUTERISED MINE DESIGN EXAMINATION**

EMI 3205

Final Examination Paper

June 2020

This examination paper consists of 3 pages

Time Allowed: 4 hours

Total Marks: 100

Examiner's Name: Eng Murewa B Zvigumbu

INSTRUCTIONS

1. Answer **ALL** questions.
2. Section A question one has a total of 50 Marks & section B question two has a total of 50 Marks.
3. Save your models and export files in line with question(s) into the examination folder with your registration number.
4. No secondary storage devices to be used (physically plugged/ wireless plugged) or otherwise TO the examination workstation.

Additional Requirements: Personal computer workstation, Surpac & Microsoft Project software.

MARK ALLOCATION

Questions	Marks (100 MARKS)
Question (1)	50
Question (2)	50
Total Attainable	100

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Section A: Geological Modelling, Mine Design & Volumetric Computation

Question: 1

The Project Task Team leader of a newly proposed Open Cast Coal Mine requests that you look into the preliminary feasibility of opening a second open pit. This is to strategically complement the existing operations and meet upsurge in coal demand by Zimbabwe Power Company (ZPC).

Relevant geo-information is made available to you. The Geological data folder has geological information on the diamond drilling program conducted for Entuba Coal fields in Hwange. The bore drill hole data shows the core logging from the original surface, intercepts Top of Coal (TC) and intercepts with the country sandstone footwall (FW). The coal seam is continuous from the wall and ranges between 9m – 13m.

The target market for the coal is ZPC where two types of coal can be utilized. The economic cut of grade of the coal deposit depends on the boiler technology employed by ZPC in its coal-fired power stations across the country. The main power station is at Hwange and the small power stations are located in Bulawayo, Munyati and Harare.

The small power stations utilize washed low ash coal with ash content of less than 15%. On the other hand, the main power station (Hwange) is located less than 20 km from the deposit and therefore can economically utilize coal with high ash content ranging between 20% to 30% ash.

- i. Calculate the volume of overburden to be stripped. **[20 MARKS]**

- ii. Determine the expected tonnage of Coal and coal tonnage to be extracted given that the density of coal is 1.495 t/m^3 . **[20MARKS]**

- iii. Design the access ramp to the footwall of the box cut to extract the coal in the box cut. State your assumptions. **[MARKS 10]**

Section B: Mine Planning & Scheduling

Question: 2

Open Cast Mine in Hwange intends to ramp up its production to **240 000 tpm** of steam coal. This is to meet the increased steam coal demand due to Zimbabwe Power Company Stage 7 & 8 expansion of Hwange Power Station. The stripping ratio is 3.0 **bcm/t**, swell factor of **1.5** and coal in situ density of **1.495 t/m³**. The coal hauling capacity is **4 500 t/shift** and an overburden capacity of **15 000 m³/shift**.

The drilling equipment consist of

- i. Two Atlas Roc L8 **165 mm** diameter Top the Hammer drill rig with an average drilling rate of **45m/hrs**;
- ii. Rotary drill rig Bucyrus Erie 61R **300 mm** diameter bit with an average drilling rate of **60m/hr** and;
- iii. Two Tram rock TS25K **120 mm** diameter bit with an average drilling rate of **75m/hr**.

The mine operates three 8hr shifts 24 hours a day from Monday to Saturday. Sunday is a non-working day, reserved for planned maintenance by management on all fixed and mobile equipment. The overburden profile consists of sandstone, fireclay and black shale lithologies overlying coal seam consisting of the Power and Coking Coal seams. The recommended optimised drilling patterns and good fragmentation are given in table Q2 (a) below.

Table Q2a: Drilling Parameters

Lithologies	Burden(m)	Spacing(m)
Sandstone	3.0	3.5
Fireclay	10	12
Blackshale	10	12
Power Coal	6	7
Coking Coal	7	8

- a) Generate monthly coal and overburden production schedules stating any assumptions you have taken into consideration. **[MARKS 30]**
- b) Allocate the resources for the activities using guidelines in Q2 (b) below and set a baseline for the monthly coal & overburden production schedule. **[MARKS 10]**
- c)

Table 1b: Resources allocation.

Tasks	Resources Allocation	Review 21 days
Sandstone Stripping	David @ \$100/hr; John @ \$150/hr. Sandstone drilling @ \$8.00/m. Explosive Cost @ \$150 000. Total Hauling & Loading cost @ \$6/bcm.	100% Complete
Fireclay Stripping	David @ \$100/hr; John @ \$150/hr. Fireclay drilling @ \$6.00/m Explosive Cost @ \$75 000. Total Hauling & Loading cost @ \$5/bcm.	100% Complete.
Blackshale Stripping	David @ \$100/hr; John @ \$150/hr. Black shale drilling @ \$5.00/m. Explosive Cost @ \$75 000. Total Hauling & Loading cost @ \$3bcm	50% Complete.
Power Coal Extraction	David @ \$100/hr; John @ \$150/hr. Power Coal drilling @ \$8.00/m. Explosive Cost @ \$15 000. Total Hauling & Loading cost @ \$2.25/tonne.	Moved back 7 days.
CokingCoal Extraction	Murray @ 100/hr; David @ \$100/hr; John @ \$150/hr. Power Coal drilling @ \$8.00/m. Explosive Cost @ \$15 000. Total Hauling & Loading cost @ \$2.25/tonne.	Moved forward 5days.

- (c) Review the project after 21 days and state the expected completion date.

[6 MARKS]

- (d) Determine the variation of cost between the preliminary and final project cost.

[4

MARKS]

***** **THE END** *****