

MINING 1 (COAL) – OCTOBER 2011

QUESTION 1

1.1 You are the Section Manager of a shaft comprising 2 continuous miner sections, each targeted to produce 65000 tons of coal per month. You have been tasked to increase production to 100 000 tons per section per month. What factors would you consider in order to achieve this step change? (10)

To be considered:

Cutting time increase – no. of shifts, transportation of people – optimise shift changes – consider overlaps,

Increase loads/no. of loads

Technology: bigger/better CM; s/cars, FCT

F / Breaker, Belt infrastructure, (sxn + trunk)

Some candidates concentrated on people and management issues, only sufficient for 2 marks.

1.2 The information obtained from horizontal drilling into a coal seam indicates that there is a 3 metre dolerite intrusion with approximately 40 metres of 'burnt' coal releasing methane 420 metres in front of an advancing continuous miner production section. There are no other panels available to relocate the section to.

Describe your plan of action to maintain production (20)

To be considered:

Sourcing of all relevant info for planning

Geology – steps, anticipated roof conditions – roof & sidewall support regime

Devolatilised coal – typical conditions

Vent requirements, fans – force or exhaust

Definition of special area

Reduction of no. of roadways

Development style – Drill & Blast; CM/Roadheader

Manning and number of shifts

Stowing of blasted material

Students did not take cognisance of most of the above. Surprisingly most missed detailed planning related to ventilation and support.

Lack of understanding of the problem was displayed which impacted on the answers.

Hi 16 Lo 5 [30]

QUESTION 2

2.1 In-pit crushing of coal and transfer onto a conveyor belt which runs to the beneficiation plant has been proposed as an alternate for truck and shovel hauling. List the positives and negatives of such a method. (10)

The major considerations should have been environmental impact, cost, maintenance and flexibility, most of which was missed by the candidates.

2.2 List 5 advantages and 5 disadvantages of draglines when used in strip mining (10)

Hi 10 Lo 7 [20]

QUESTION 3

3.1 You have been employed as a project manager on an existing underground coal mine. The workings have progressed a significant distance beyond the incline shaft and there is a requirement to develop a vertical downcast shaft closer to the production sections. The mine is 150m deep, and the technical staff has selected the raise bore method, with a requirement of a 6m diameter.

3.1.1 Describe the raise bore method of shaft sinking (5)

Not attempted by one candidate and other candidates showed a lack of understanding the technical aspects of raise boring. Technological improvements were also missed.

3.1.2 What considerations should be taken account off, both underground and on surface? (15)

Some candidates did not take account of logistics on surface and underground. Others did not consider stowing of material and issues such as safety of personnel during operations. Where they did identify specifics, these were not followed up by detailed discussion worth 15 marks. Candidates also showed a lack of understanding the practical aspects of running a raise-bore operation.

Hi 16 Lo 2 [20]

QUESTION 4

4.1 The overburden of a mini-pit mine comprises alternating sandstones and shale. The average thickness is 12m. The overburden overlays a coal seam which was previously mined by bord and pillar methods. The seam is 5.0m thick. Assuming that the underground extraction was 60%, the working area of the mine is 500,000m², and the density of coal is 1.47t/m³, calculate:

4.1.1 The strip ratio Poor knowledge of Strip Ratio (7)

4.1.2 The life of mine (in months), assuming a required annual rate of 600,000t. Assume additional mining and geological losses of 11%. Poor knowledge of tonnage calculations (6)

4.1.3 Describe 2 methods to prevent spontaneous combustion of the coal seam (4) not answered or no knowledge

4.1.4 Assume that the loader available is capable of loading the monthly coaling requirement, and that the mine will operate on day shift only (8hrs), calculate the number of 80 ton trucks required to achieve the monthly coal requirement, assuming:

The average cycle time is 40 minutes

The engineering availability is 85%

Utilisation is 90%

A maximum of 20 days in a month

Load factor of 100% (8)

Bar one candidate, they were not able to correctly calculate tonnages per day and month, nor to calculate the number of trucks based on the given availabilities.

4.2 List 5 reasons why it is important to manage water in an open pit environment (5)

Answers should consider amongst others, the affect on the various production cycles, slope stability, affect on machine productivity, damage to tyres, safety of LDVs (rocks in water) and catastrophic flooding causing machine and operator loss. These were not considered adequately.

Hi 19 Lo 4 [30]