

MINING 1 - COAL (October 2009)

Question 1

1.1 List 5 physical factors which influence the choice of explosives on an open-pit coal operation. (5)

Geology, Engineering Properties, Presence of water, Mine design and mining method, Equipment

Most Candidates did not recognise that the question required 'physical factors'.

1.2 Give a brief description of each factor (10)

Lithology and joints/fractures, etc.

Density, compressive strengths, shear strengths,

Pump or water based explosive

Dragline, Truck & shovel or cast blast

Diameter of holes, desired fragmentation, etc. -

[15]

Question 2

A large area in a coal mine where you are the production manager has been mined by hand-got methods (cut and blast Bord & Pillar.) This area was last mined 20 years ago and is sealed off.

Due to technological advances in mining equipment now available, this area is now considered as mineable reserves.

2.1 Describe in detail how an initial evaluation of the area will be done and by whom?

2.2 What ground conditions would you expect to find and prescribe the support system(s) you will implement. (Motivate your answer.)

2.3 Describe in detail by means of sketches the stooing method/sequence you will implement. (Motivate your answer.)

In my opinion the candidates' answers were very basic and most assumptions made were totally un-realistic (SF. + 2.00 after 20 years??)

Not one took over-all ownership - accountability and appointed all and sundry to oversee and produce COP's with-out getting involved

Initial opening and bleeding of the dormant area was not bad but none suggested a 'Graham's Ratio' CO/CO₂ deficiency graph if excessive CO was detected

[30]

Question 3

3.1 List 5 advantages of longwall mining (5)

3.2 List 5 disadvantages of longwall mining (5)

Should have been straightforward, but lack of thorough preparation and knowledge observed

[10]

Question 4

4.1 List 5 factors to consider when selecting haul truck tyres (5)

Type of truck, load, speed, durability, performance, cost

Could be applied to the purchase of any tyre, yet poorly answered.

4.2 It is extremely important to maintain smooth, firm, well drained haul roads. Describe 5 reasons why this is true (10)

Productivity, reduced vibration (less maintenance and operator comfort), improved tyre life, reduced dust, safety

[15]

Question 5

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 4.1m thick. Assuming that the underground extraction was 58%, and the area of the mine is 560,000 m² and the density of coal is 1.47, calculate:

5.1 The strip ratio (7) $(560000 \times 12) / (560000 \times 4.1 \times 1.47 \times 0.42) = 4.74$ (2)
some candidates did not know what Strip Ratio is

5.2 Assume additional mining and geological losses of 11%, calculate the life of mine (in months), assuming a required annual rate of 1,080,000 (6)
Calc tons $- 0.89 \times 560000 \times 4.1 \times 1.47 \times 0.42$ (2), calc. of monthly rate $- 1,080,000 / 12$ (2), 14 months (2) some candidates did not adjust for underground extraction and mining & geological losses.

5.3 Describe 2 methods to prevent spontaneous combustion of the coal seam (4)

Buffer blasting and highwall cladding

5.4 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 140 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)

[25]

Question 6

List 5 factors which should be considered when designing pillars for later pillar extraction (5)

[5]