

National Exams December 2002  
98-MMP-A2 Mining Methods and Design

3 hours duration

Notes:

1. If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper a clear statement of any assumption made.
  2. Any non-communicating calculator is permitted. This is an open book exam.
  3. Illustrate your answers where applicable.
  4. Any five questions constitute a complete paper and only the first five questions that you answer will be marked.
  5. All questions are of equal value.
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1. A continuous high-grade hard-rock vein is located 400 metres below surface. Its characteristics are the following:
- Dip: 70 degrees
  - Horizontal width: 4 metres
  - Quality of footwall and hanging wall: fair

Which mining methods could be considered for the extraction of this orebody? Compare each method in relation to the development required, productivity, operating costs, ground support, dilution, and ore recovery.

2. Two common caving methods are sublevel caving and block caving. List the advantages and disadvantages of each method and describe situations in which they might be used.
3. An underground flat-lying coal seam is being mined by room-and-pillar. The workfaces are 7 metres wide by 3 metres high. Describe the various rockbreaking machines that could be used and the handling equipment arrangements to bring the ore to surface assuming that the access to the mine is by ramp from an adit.
4. An orebody consists of a vein dipping 60 degrees with a strike length of one kilometre. The top of the orebody is located 500 metres below surface and ends at 900 meters below surface. The ore is to be extracted at a rate of 3000 tonnes per day on three shifts per day for 6 years. Access from surface will be through a shaft. The main levels will be located every 100 meters, with 2 sublevels between each.

Design the general lines of an ore handling system, proposing the location of the shaft, raises, transport drifts, crosscuts to the raises, transfer raises, and mobile equipment used. Include the factors you took in consideration in taking your decision. Provide hand-drawn sketches of your layouts to complement your description.

5. An 11,000 tonnes-per-day open pit operation at the prefeasibility study stage is considering options for transporting the ore from the pit to the mill, located 2 kilometres away. One aspect being studied is the location of the primary crusher, either at the pit or at the mill. Discuss equipment selection alternatives from inside the pit to the mill in function of the location of the primary crusher. Rank each option in terms of capital costs. Suggest one option for design purposes and discuss your choice. Do you foresee factors that would invalidate your choice, and force you to go to the more expensive option?

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6. The final design of an open pit operation is influenced by many factors. Describe how the mine design and operations can be affected by each of the following:

- a) Groundwater
- b) Waste rock disposal
- c) Remoteness of operations
- d) Environmental restrictions

7. The stripping ratio of an open-pit mine can have an important impact on the economic viability of an operation. During the life of the mine, the actual stripping ratio can change from one period to the other. Define each of the following concepts:

- 1) Declining Stripping Ratio Method
- 2) Increasing Stripping Ratio Method
- 3) Constant Stripping Ratio Method

Based on the previous concepts, suggest a sequence of stripping ratio over the life of the mine in order to rationalize cash flows, manpower and equipment use.

8. A vein is dipping at an angle of 60 degrees to the west. Draw an idealized cross section looking north and discuss how the design of your benches and berms can influence the stripping ratio and ground support of this open pit.