ORDRE DES INGÉNIEURS DU QUÉBEC

NOVEMBER 2018 SESSION

Open-book examination
Calculators : only authorized models
Duration : 3 hours

Exam 14-MI-A2 Underground Mining Methods and Design
Total = 100 points

All documentation allowed

Question 1 (35 points)

You have to mine an orebody that is 300 m long by 20 m wide and 800 m high with the long hole mining method. The slope of the orebody is 90°. The orientation of the orebody is east-west. The main production shaft is 150 m south of the eastern limit of the orebody and the ventilation shaft is 100 m south of the western limit of the orebody.

Design (draw) the main level at the bottom of the orebody, including the drawpoints. Show all the main excavations and infrastructures needed and distance between them. Also indicate the slope of drifts when needed.

Question 2 (15 points)

Select the best mining method for the following orebodies (justify your selection) and describe briefly (max 15 lines) the mining sequence for the selected method

Orebody #1: Medium width vein (10-15 m) with a dip of 45°. The vein is 400 m long and 500 m high. The mineralized rock is relatively competent (RMR = 75) but the surrounding rock mass is weaker (RMR = 60). The orebody is located at 500 m deep.

Orebody #2: Massive mineralized orebody (700 m x 500 m x 800 m) (Length x width x height). The mineralized rock mass is strong with a RMR of 80. A major fault with almost no cohesion limits one side of the orebody. The top of the orebody is 300 m deep.

Orebody #3: Subvertical orebody (dip 70°- 85°) 5 m wide, 200 m long and 800 m high. The mineralized rock is strong (RMR = 70) but the hanging wall is week (RMR = 25) and the footwall is good (RMR = 65). The orebody is at a depth of 1000 m.

Question 3 (30 points)

You want to ventilate with an auxiliary system an underground opening where 1 scoop and 3 trucks will operate at the same time. The scoop requires 10 m^3/s of fresh air while a truck requires 20 m^3/s. A test on the ventilation system showed that the head loss in the auxiliary system is 816 Pa for an airflow of 20 m^3/s.

a) Determine the total airflow that is required

b) Determine the new head loss that will be generated with the airflow found in a)

c) To ventilate the opening, you have an unlimited number of auxiliary fans that can produce 5000 Pa for 35 m^3/s. What would be the arrangement of fans needed to ventilate the opening using the values found in a) and b)

Show all calculations and draw the fan arrangement.

Question 4 (20 points)

You have 3 options for an equipment:

	Reconstruction	**New**	**Rent**
Initial cost	360 000$	920 000$	0
Annual cost			
Maintenance	140 000$	85 000$	
Labour	240 000$	160 000$	525 000$
Parts	58 000$	42 000$	
Term	8 year	8 year	8 year
Residual value	0	120 000$	0

With an annual interest rate of 8%, what option is the cheapest?

Justify your answer show all your calculation