

Minerals Council South Africa



EXAMINATION

SUBJECT: CHAMBER OF MINES OF SOUTH AFRICA CERT. IN STRATA CONTROL (COAL.) SUBJECT CODE: COMSCC EXAMINATION DATE: 8 OCTOBER 2019 TIME: 14:30 – 17:30	EXAMINER: DANIE SNYMAN MODERATOR: MARC HENDERSON TOTAL MARKS: [100] PASS MARK: 60%
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NUMBER OF PAGES: 4

SPECIAL REQUIREMENTS:

1. Answer ALL the questions

- References other than those provided are not permitted.
- Hand-held electronic calculators may be used.
- Put your examination number on the outside cover of each book used and on any graph paper or other loose sheets handed in.

NB: your name must not appear on any answer book or loose sheets.

- Write in ink on the **RIGHT HAND SIDE** of the paper only (only content on the right hand pages will be marked).
- Show all calculations on which your answers are based.
- State all assumptions you have made.
- Illustrate your answers by sketches or diagrams wherever possible.
- In answering these questions, full advantage should be taken wherever necessary of your practical experience as well as of the data given.
- Answers must be given to an accuracy which is typical of practical conditions.
- The use of cellular phones are prohibited.

QUESTION 1 (MONITORING)

- 1.1 The resident geologist informed you that one of the continuous miner sections at your mine might be mining towards a projected dolerite dyke. What is all the rock mass conditions and behaviours to look out for that will indicate to you that the section is approaching and is close to the intrusion. (10)
- 1.2 Describe the visual inspections that you will conduct at a roof bolter operation to assess if the systematic support units are installed according to your mine's specifications. (10)
- 1.3 Discuss the effects of high horizontal stress on a weak, thinly laminated roof and the possible visible signs that may be seen in these conditions. (5)

(25)

QUESTION 2 (SUPPORT SYSTEMS)

- 2.1 Sketch and describe the support systems you would recommend in the following underground situations:
- a) A slip dipping at 60° in the roof of a normal roadway.
 - b) A slip of which the bottom daylight in a pillar corner.
 - c) Weak laminated shale underlying a strong self-supporting sandstone beam.
 - d) A highly stressed roof zone.
 - e) The boxing area in an intersection that was excavated too wide. (10)
- 2.2 A 1m thick shale layer overlaying a coal seam has to be suspended from a self-supporting sandstone layer in the 6m wide roadways. Assume that the weakest interface in the system is the resin to rock contact which has a shear strength of 2MPa. The systematic support system used at the mine is 20mm resin roof bolts installed on a 1.5m by 1.5m grid. The roof bolter normally drills 26mm diameter holes and can install support units within 0.75m from the sidewall. What is the minimum length of bolts that can be used at this mine? (State all your assumptions) (11)
- 2.3 What do you understand about passive and active support? Give an example of each normally used in a coal mine. (4)

(25)

QUESTION 3 (BASIC PRINCIPLES)

3.1 Explain with the aid of sketches and mathematical equations the following terms. Also supply unit of measurement where applicable.

- a) Density (2)
- b) Bulking factor (2)
- c) Stress (2)
- d) Strain (2)
- e) Elastic modulus (2)

3.2 Two roadways have to be developed through a 25m thick dolerite dyke. The planned roadway dimensions are 6m wide and 3m high.

- a) What are appropriate assumptions for the relative density and bulking factor of the material to be excavated? (2)
- b) What is the mass of the rock that will have to be excavated? (3)
- c) If an LHD with a 5m³ bucket is used for loading out the faces, how many trips will it have to make during this project? (3)

3.3 Describe with the aid of diagrams the effect of confinement on rock strength. (4)

3.4 With the aid of a sketch explain how the vertical and horizontal stresses are redistributed around a newly excavated underground roadway. (3)

(25)

QUESTION 4 (MINE DESIGN)

4.1 An area is developed with the following geometry:

- Pillar centres = 14.0 m
- Bord width = 6.5 m
- Mining height = 2.5 m
- Depth to floor = 56.0 m
- Total seam thickness = 4.9 m

- a) Determine the percentage areal extraction. Show all calculations. (3)
- b) What would the increase in coal tonnage be if an additional 1.8 m of coal was extracted by top-coaling? (4)
- c) Determine the percentage volumetric extraction after top-coaling. (3)
- d) What are the safety factors of the pillars in the panel before and after top coaling? (6)

4.2 In multi seam mining, several factors contribute to the interaction between the seams. List and briefly discuss 3 of these factors. (6)

4.3 Briefly discuss 3 factors that may result in sinkhole formation. (3)

(25)

FORMULA SHEET

$$S = 7,2 \frac{w^{0.46}}{h^{0.66}}$$

$$S = 5.47 \frac{w^{0.8}}{h}$$

$$L = \frac{0.025HC^2}{w^2}$$

$$FS = \frac{S}{L}$$

$$FS = 288 \frac{w^{2.46}}{Hh^{0.66}(w+b)^2}$$

$$\theta_t = \frac{\gamma L^2}{2t}$$

$$\theta_t = \frac{3\gamma L^2}{t}$$

$$\theta_t = \frac{3\gamma L^2}{4t}$$

$$L_a = \frac{\rho g S^2 t_i}{\tau \pi D_h} + 0.05$$

TOTAL MARKS

(100)