



EXAMINATION

SUBJECT: CHAMBER OF MINES OF SOUTH AFRICA CERTIFICATE IN STRATA CONTROL (COAL.) SUBJECT CODE: COMCSC EXAMINATION DATE: 7 MAY 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 You are required to conduct a planned task observation for the correct installation of full column resin roof bolts. The support material used at the mine are roof bolts with a diameter of 20mm and a length of 1500mm together with dual speed resin capsules. List the steps and their specification that the team should follow to ensure a proper installation of systematic roof support for beam building. (12)
- 1.2 If 25.6mm drill bits are used for the installation of the roof bolts mentioned in Question 1.1 will a full column installation be obtained if the resin capsules are 900 mm long and 23 mm in diameter? Show all your assumptions and calculation. (10)
- 1.3 The width of the roadways at the mine mentioned in Question 1.1 are 7m and the roof bolts are installed in a 1.5m by 1.5m grid. Which bolts in the rows are the most important for beam creation and why? (3)

(25)

QUESTION 2 (SUPPORT SYSTEMS)

- 2.1 What is the minimum bolt length that can be used if a 1m thick shale layer has been suspended from a self-supporting sandstone beam 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 2 MPa. The systematic support system specified for the project 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? (State all your assumptions) (10)
- 2.2 Give two examples of active support systems and two examples of passive support systems and their common uses in underground coal mines. (6)
- 2.3 What aspects of the roof bolt installation process should be attended to if a stiff and active support system is required to combat high horizontal stress. (5)
- 2.4 With the aid of sketches describe the basic construction of a dual speed resin capsule? (4)

(25)

QUESTION 3 (BASIC PRINCIPLES)

3.1 You are required to construct a Mohr Failure Envelope. Briefly describe the test that you would conduct to obtain the inputs for your graph. (5)

3.2 A rock sample, 105.30 mm long with a diameter of 0.0418 m and a mass of 304.9 gram is subjected to a uniaxial compressive load. Just before failure at a load of 59.61 kN the length of the sample was measured at 104.1 mm.

Determine the following:

a) Density of the rock. (5)

b) Uniaxial compressive strength (UCS) of the sample. (8)

c) Elastic modulus of the rock. (5)

3.3 What rock properties can be determined with the Brazilian test? (2)

(25)

QUESTION 4 (MINE DESIGN)

4.1 Calculate the pillar dimensions to the nearest 0,5 m for the primary developments panels with the following mining parameters:

a) 100 m deep, 7 m wide roadways and 4 m mining height. (5)

b) 200 m deep, 6.5 m wide roadways and 2.5 m mining height. (5)

4.2 Determine the percentage areal and volumetric extraction if the seam thickness in situation 4.1 (b) is 3.5 m. Show all calculations. (6)

4.3 A sinkhole, 7 meters in diameter and 15 meters deep must be filled with sandstone that will be excavated from a nearby open pit. Assume that the density of in-situ sandstone is 2500 kg/m³ and the bulking factor for broken sandstone is 1.4. Determine the following:

a) The in-situ volume of the sandstone to be excavated to fill the sinkhole. (7)

b) The mass of sandstone to be transported. (2)

(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)