

EXAMINATION PAPER

SUBJECT: CERTIFICATE IN STRATA CONTROL (COAL) SUBJECT CODE: EXAMINATION DATE: MAY 2013 TIME:	EXAMINER: D. NEAL MODERATOR: B. MADDEN TOTAL MARKS: [100] PASS MARK: 60%
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NUMBER OF PAGES:

SPECIAL REQUIREMENTS: 1. Answer <u>ALL FIVE</u> questions 2. References other than those provided are not permitted. (Refer No. 10) 3. Hand-held electronic calculators may be used. 4. 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. 5. <u>Write in ink on the RIGHT HAND SIDE of the paper only (only the right hand pages will be marked).</u> 6. Show all calculations on which your answers are based. 7. Illustrate your answers by sketches of diagrams wherever possible. 8. In answering these questions, full advantage should be taken wherever necessary of your practical experience as well as of the data given. 9. Answers must be given to an accuracy that is typical of practical conditions.
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CERTIFICATE IN STRATA CONTROL (COAL)

Question 1

- 1.1 Explain the parameters in the Q-rating system and their reduction factor where applicable. (8)

$$Q = \frac{RQD}{J_n} \times \frac{J_r}{J_a} \times \frac{J_w}{SRF}$$

- 1.2 Calculate RQD for a 100m long borehole with 24 fractures more than 100mm apart. (2)
- 1.3 Calculate the Q-rating using the RQD value from 1.2 above and the values in the Table below, for a planar, smooth dominant joint set plus random jointing. Some joints are tightly healed with impermeable filling while others are loose and with slight weathering. (6)

Parameters	Values
J _n	3
J _r	1
J _a	5
J _w	1
SRF	1

- 1.4 Comment on the Q rating obtained how it could be used in a mining scenario. (4)

[20 MARKS]

Question 2

2. Define the following terms, give the units and explain their relevance in rock engineering design;

- 2.1 Shear Strength (3)
2.2 k – ratio (3)
2.3 w:h ratio (3)
2.4 Subsidence (3)
2.5 Stiffness (3)

- 2.6 With the aid of diagrams describe how compressive, shear and tensile stresses are distributed in a clamped end beam. (5)

[20 MARKS]

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Question 3

3.1 The COMRO Shallow pillar Guidelines were updated by Canbulat and Madden in 2005. What are the updated Guidelines Parameters? (6)

3.2 Design the minimum pillar in a bord and pillar layout for a 3,0 m seam, depth to floor 30 m for a bord 7,2 m. What are the Safety Factors using Salamon, van der Merwe and the continuous miner adjustment? What length of pillar should be left at the portal of a highwall for this design? (14)

[20 MARKS]

Question 4

The formula for induced tensile stress in a competent clamped beam is:-

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

4.1 Determine the percentage increase in induced tensile stress due to an increase in bord width from 6m to 7m and then to 8m. (8)

4.2 The tensile strength of coal is 1.3MPa and the density of coal is 1550 kg/m³ calculate the minimum thickness of a competent coal beam 6m long. (6)

4.3 If the beam consisted of sandstone why would this influence its minimum thickness? Show a calculation to justify your answer and state all assumptions.(6)

[20 MARKS]

Question 5

5.1 Name the 3 main rock types associated with coal bearing strata and give an example of each, including typical rock strength. (6)

5.2 What geotechnical problems are commonly associated with dykes and give examples of how could they be managed? (8)

5.3 Describe with the aid of diagrams the influence of various types of discontinuity on roof , pillar side or highwall stability. (6)

[20 MARKS]

Strata Control Formulae

$$S = 7,2 \frac{w^{0,46}}{h^{0,66}}$$

$$S = 3,5 \left(\frac{w}{h} \right) (MPa)$$

$$L = \frac{25 H C^2}{w^2}$$

$$\eta = \eta_o \left(1 + \frac{2 \Delta w_o}{w} \right)^{2,46}$$

$$n = SF \frac{pgt}{Pf}$$

$$Lb = \frac{d_c^2 Lc}{D^2 - d^2}$$

$$\tau = \frac{Pf}{\pi . D . Lb}$$

$$\eta = \frac{\gamma L^4}{32 E t^2}$$

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

$$FS = 288 \frac{w^{2,46}}{Hh^{0,66} (w + b)^2}$$

$$\sigma_s = 7.2 \frac{R_0^{0.5933}}{V^{0.0667}} \left\{ \frac{0.5933}{\varepsilon} \left[\left(\frac{R}{R_o} \right)^\varepsilon - 1 \right] + 1 \right\}$$

$$\tau = c + \sigma_n \tan \phi$$

$$V_s = \frac{4 \pi r^3}{3}$$