



PROGRAM : NATIONAL DIPLOMA
MINING ENGINEERING

ASSESSMENT : SUPPLEMENTARY EXAMINATION

SUBJECT : TECHNICAL SERVICES

CODE : MTL3211

DATE : 6/ 01/2019

DURATION : 3 HOURS (15H00 -18H00)

TOTAL MARKS : 100 Marks

WEIGHTING : 60% YrMark

EXAMINER : WB MOTLHABANE

MODERATOR : T. MATAMBELE

INSTRUCTIONS

1. ANSWER ALL QUESTIONS
 2. UNDERLINE AFTER EACH QUESTION AND LABEL THE QUESTIONS AS LABELLED IN THE PAPER
 3. NO CELLPHONES (SWITCH-OFF)
 4. DO NOT USE TIPPEX/INK ERASOR
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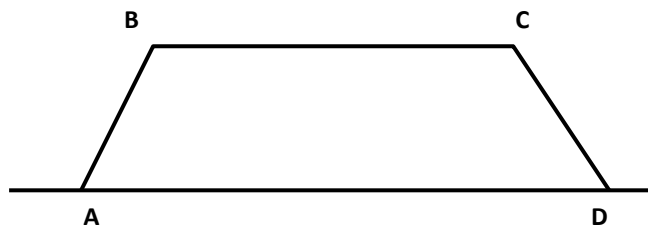
QUESTION ONE

- a) List at least five (5) sources of dust liberation and discuss how these sources you have listed can be mitigated against. [10]
- b) List and explain at least three (3) common lung diseases can could be contracted in our mines. [6]
- c) Discuss the coal concentrations for coal dust explosion to occur with both minimum and maximum violence. [5]
- d) Discuss essential requirements for dust explosion to occur. [5]
- e) Explain how a volatile content in the coal would influence the ignition sensitivity of dust explosion. [2]
- f) What are the provisions of legislation in terms occupational exposure limits to combat silicosis? (2)

[30 marks]

QUESTION TWO

- a) Determine if a personnel will be safe, if she took refuge behind a brick wall of overall strength 1 Mpa when a 300 bar m/s shockwave of coal dust explosion is set off. [5]
- b) Two airways as shown in the diagram are connected in parallel.
Airway AD is a tunnel, 150m long, 3,5m wide, and 3,5m high.
Airway ABCD is a tunnel, 180m long, 2,6m wide, and 1,9m high.
The air density = 1,2kg/m³.



Calculate the combined resistance of the system. [5]

Assume $K = 0,01 \text{Ns}^2/\text{m}^4$.

[10 marks]

QUESTION THREE

- a) Define Young's Modulus and explain how you would go about determining it for a rock sample in a laboratory. In addition to your explanation include the use of appropriate graph to further illustrate your answer **(10)**.
- b) Without using the direct test explain how else you may determine the tensile strength of a rock sample in laboratory, include sample preparation discussion **(10)**.
- c) Demonstrate by use of suitable graph how the confinement can increase the peak strength of a rock sample. Give practical example of where confinement principle could be applicable **(5)**.
- d) Explain the difference between K ratio and Poisson's ratio **(5)**

[30 marks]

QUESTION FOUR

Consider sign conventions and magnitudes of stresses below;

Sign conventions		
Normal Stress	Shear Stress	Angles
Negative: Tensile	Clockwise: Positive	Clockwise: Positive
Positive: Compressive	Anti-clockwise: Negative	Anti-clockwise: Negative

$$\tau_{xy} = -12 \text{ Mpa}; \delta_x = -8 \text{ Mpa and } \delta_y = -10 \text{ Mpa}$$

- i. Construct and fully label stress element diagram for this state of stress. **(15)**
- ii. Construct Mohr circle and determine the major and minor principal stresses and Maximum shear stress as well as all their directions. **(15)**

[30 marks]

[TOTAL MARKS 100]