PROGRAM : NATIONAL DIPLOMA: MINING ENGINEERING
            B Tech: MRM

SUBJECT : Mining Technical Services

CODE : MTL3211

DATE : SUMMER SSA EXAMINATION 2017
       9 JANUARY 2017

DURATION : (SESSION 3) 15:00 - 18:00

WEIGHT : 40 :60

FULL MARKS : 100 :

TOTAL MARKS : 100

EXAMINER : MR PJ KNOTTENBELT

MODERATOR : Mr D ARNOLD

NUMBER OF PAGES :

INSTRUCTIONS : CALCULATORS ARE PERMITTED (ONLY ONE PER
                STUDENT)
                Clean formula / information sheet brought in by student

REQUIREMENTS : NORMAL
QUESTION 1:

Define or explain using sketches and realistic numeric examples the following terms:
1. Poisson’s Ratio
2. Strength
3. Tributary area for a support unit
4. Critical half span

(15)

QUESTION 2:

Define or explain using sketches and or realistic numeric examples the following terms:
1. Total pressure at a point and time
2. Air Power
3. Dust
4. STEL

(15)

QUESTION 3:

A stope at a depth of 2 600 has a stope width of 1,1m. The rock mass around the stope has the following characteristics:
Density 2 700kg/m³; Poisson’s Ratio 0,20; Modulus of Rigidity 30GPa
UCS 210MPa

a) If the stope span is 200m, calculate the vertical stress at the following distances ahead of the face: 1m, 2m, 5m, and 10m.
b) By calculation or graph establish the distance ahead of the face at which vertical stress will be equal to UCS.
c) Calculate the vertical stress at the face.
d) Comment on the answer to c) above and the general stress configuration as calculated above and the reality of the stresses in practice.

(15)

QUESTION 4:

A bord and pillar section has the following layout:
Pillars 9 x 9m; Bord width 7m; Seam height 2,5m
Depth to seam floor: 79,3m overburden of RD 2,1, of which 7,3m is dolerite sill at RD 3,1

a) Calculate the pillar strength.
b) Calculate the pillar load.
c) Calculate the Safety factor and comment on its value.
d) Explain why a SF of 1,6 is seen as very safe.
QUESTION 5:

A Development haulage (3.5m x 3.5m) and its crosscut (3m x 3m) is to be ventilated from through ventilation using a single force fan delivering 4.2m³/s. The haulage galvanized 620mm diameter column (K = 0.003 Ns²/m⁴) is 28m to the breakaway of the 46m 500mm diameter galvanized iron column for the crosscut. The total length of the haulage column is 179m.

a) Represent the layout as you would expect it on a plan.
b) Establish the total resistance of the system including the return air pathways (K 0.012Ns²/m⁴)
c) Establish the quantity flow rate being delivered to both the haulage and the crosscut ends and comment on the sufficiency of this quantity
d) Establish the static pressure that the fan is producing
e) Assuming an efficiency of 0.83 establish the cost of running such a fan for 30 days if electrical energy supply is costed at 81c/MJ.
f) Establish the expected air speed in each part of the returning air paths

(25)

QUESTION 6:

List and explain the occurrence, characteristics, properties and dangers of

a) Methane
b) Carbon Dioxide
c) Hydrogen

(15)