PROGRAM	**:**	**BENG** **MINING ENGINEERING**
SUBJECT	**:**	**GEOTECHNICAL ENGINEERING 3A**
CODE	**:**	**GEMIN3A**
DATE	**:**	**SUPPLEMENTARY EXAMINATION** **19 JULY 2019**
DURATION	**:**	**3 HOURS (11H00-14H00)**
TOTAL MARKS	**:**	**100 Marks**
WEIGHTING	**:**	**60% YrMark**

EXAMINER	:	WB MOTLHABANE
MODERATOR	:	J. MARITZ

INSTRUCTIONS: PLEASE READ INSTRUCTIONS!!

1. ANSWER ALL QUESTIONS **FULLY!**

2. UNDERLINE AFTER EACH QUESTION AND LABEL THE QUESTIONS AS LABELLED IN THE PAPER

3. NO CELLPHONES (SWITCH-OFF)

4. DO NOT USE TIPPEX.

QUESTION ONE

a. Consider the planes below and use Stereographic projections to answer questions that follow.

Planes	DIP (degrees)	Dip Direction (degrees)
A	35	120
B	70	70
C	80	200

i. Plot Planes A & B on the stereonet and determine the azimuth (dip direction) and dip of the intersection between these two planes. **[5]**

ii. Use poles method to determine the azimuth(dip direction) and dip of the intersection between these two planes A & B. **[5]**

iii. Plot all the planes on a new stereo net sheet and determine if a wedge will form and **also** establish if the wedge will be stable. **[5]**

iv. Comment on the stability of the wedge if the friction angle of the potential sliding plane is 35 degrees. **[5]**

[Question 1: 20 MARKS]

QUESTION TWO

a. A coal mine stooping section is located 120m below surface. During surface drilling a 5m thick dolerite rock was intersected at 70m below surface. Given that:
Goaf angle: 35^0
Density of Dolerite: 3 t/m^3
Density of Host Rock: 2.5 t/m^3
Seam height: 3m
K Ratio: 2

i. If the miner is obligated to prohibit goafing (overburden collapse) with a Safety factor of 1.5, determine the allowable maximum span of the stooping section. **[5]**

ii. Determine the maximum tilt and strains of the subsidence profile if goafing is to be allowed with a safety factor of 0.8. **[5]**

iii. Determine subsidence magnitude at the point of inflexion if the factor of safety against goafing is 0.8. **[5]**

iv. Discuss (and explain why?) the differences and similarities between pillar failure subsidence and high extraction subsidence.**[5]**

v. Discuss (and explain why?) the differences and similarities between pillar failure subsidence and high extraction subsidence.**[5]**

b. The surface infrastructure above this stooping panel comprise of a conveyor belt, a change house as well as Eskom power lines and an irrigation well.

i. Class the subsidence magnitude you have determined in Q2a above**[5]**

ii. Indicate what you may observe in regards to surface infrastructure after subsidence, assuming no mitigation factors are in place. **[5]**

iii. Provide recommendations to pre-emptively mitigate against potential risks stemming from subsidence. **[5]**

[Question 2: 30 Marks]

QUESTION THREE

a. **Figure 1** shows an exposed high wall of quarry. **Ignore** the *direction of quarrying* denoted in the picture. ALL THE LINES IN THE FIGURE REPRESENTS NATURAL JOINTS/DISCONTINUITIES.

This Highwall has been exposed for over 4 years. For scale purposes, the ***shaded rectangular block (pointed with an arrow)*** **is 4m high x 4m wide and 8m long.** The joints are characterized as non-softening, smooth and with some clayey non-cohesive infilling, slightly rough surfaces and separation less than 1mm. Joint walls are slightly weathered and the rock mass is slightly moist. Uniaxial Compressive Strength of the Roc is 200 Mpa. The maximum principal stress 6Mpa and it is horizontal and seems to provide medium to low confinement. Joints striking northwards have a dip of 45^0.

i. Estimate the RQD of this Rockmass. **[5 marks]**

ii. Estimate Q- system value for a portal development through the high wall in this rock mass. **[10 marks]**

iii. If portal is driven in a northerly direction using drill and blast. Estimate the Rock Mass Rating (RMR) and Design Rock Mass Strength (DRMS). (NB: for joint spacing use ***the mean value***) **[15 marks]**

b. Name and describe the energy waves radiated from a seismic event. Discuss the damaging mechanism associated with these waves. Use sketches to enhance your answer.**[10]**

c. Discuss the benefits of seismic events data recorded through seismic event networks in a mine. **[10]**

[Question 3: 50 Marks]

TOTAL MARKS [100]

TO BE SUBMITTED WITH SCRIPT/S

Full Names:

Student Number:

Date:

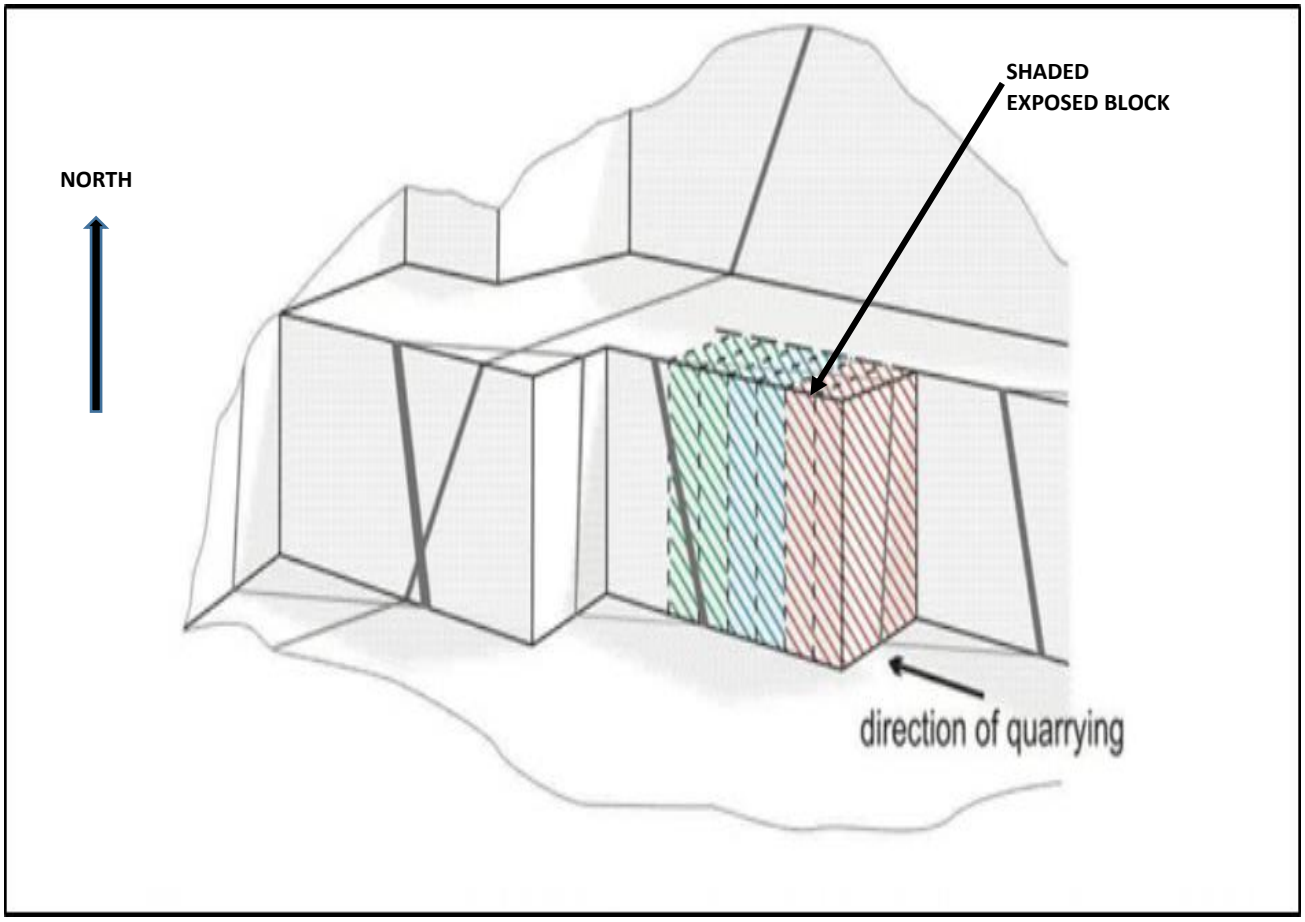

Figure 1 : For Questions 3a