PROGRAMS	:	**NATIONAL DIPLOMA** **MINING ENGINEERING**
SUBJECT	:	**MINE ENGINEERING 3**
CODE	:	**MEG3211**
ASSESSMENT	:	**SUPPLEMENTARY EXAM**
DATE	:	09 January 2020
DURATION	:	(SESSION 1) 08:00 - 11:00
WEIGHT	:	60%
TOTAL MARKS	:	87

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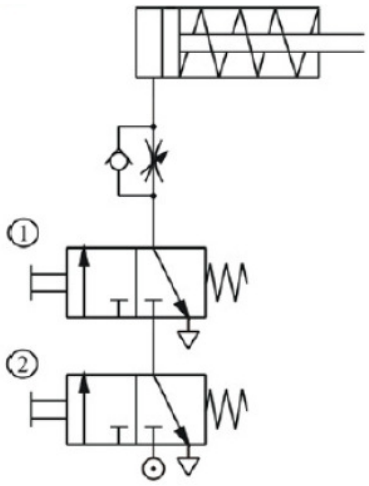
NUMBER OF PAGES:

INSTRUCTIONS

1. ANSWER ALL QUESTIONS.
2. CELLPHONES MUST BE SWITCHED OFF.
3. CALCULATORS ARE ALLOWED

Question 1

1.1. Give any 5 uses of compressed air in underground mines (5)
1.2. Explain briefly the of the working principle pneumatic system below (8)



Question 2

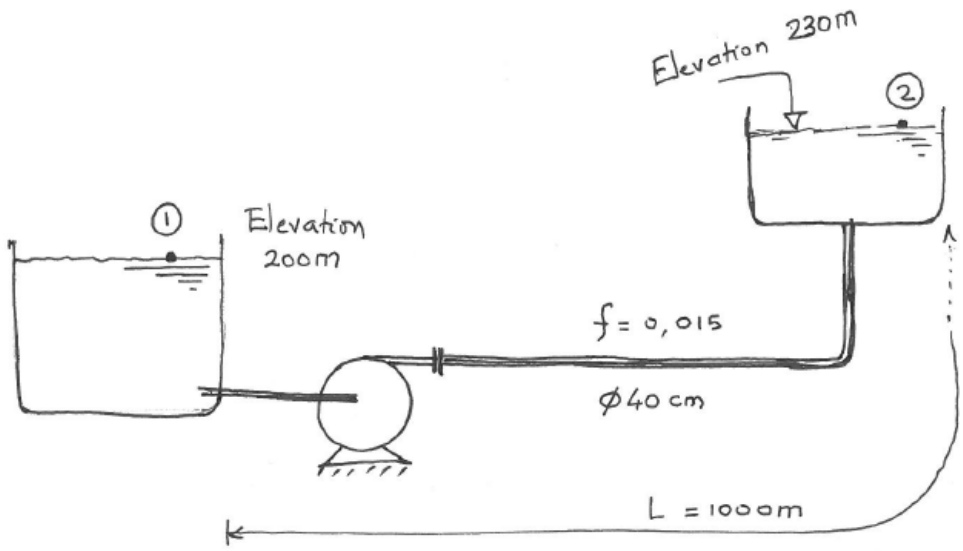
With the aid of a neat diagram explain wound rotor starting method for three-phase induction motors (8)

Question 3

Explain the working of vapour compression refrigeration system with the help of a neat sketch (8)

Question 4

Determine the discharge Q (m^3/s) for the pump whose available head vs discharge curve can be plotted using the table (see next page).



Q(m^3/s)	0	0.05	0.10	0.15	0.20	0.30	0.35
Available head (m)	58.1	58.0	56.1	54.0	49.0	30.0	0

- Major loss friction factor f = 0.015
- Coefficient K (minor losses) for different fittings
- Pipe entrance K_e = 0.5
- Bend K_b = 0.35
- Expansion (Exit) = 1.0 (26)

Question 5

A three-phase transformer with a turns ratio of 50:1 is delta-star connected. The supply voltage is 11kV and the secondary phase current is 450A.

Calculate the:

5.1. Secondary line voltage (4)
5.2. Primary phase voltage (4)
5.3. Primary line current (4)
5.4. Transformer rating (4)

Question 6

1950 tons of crushed limestone have been transported using a conveyor belt that runs non-stop for 6 hours. Other operating data from the equipment are given in the following table:

Belt speed	1.5m/s
Friction coefficient (belt vs pulley)	0.28
Wrap angle	225º
Incline angle	17º
Friction driving force	6.5kN
Inclined distance between loading and discharge points	150m
Efficiency motor of drive & pulley	85%

Calculate the following:

6.1. Power required to elevate the load (4)
6.2. Power required to overcome the friction in the system (4)
6.3. Power required from the motor (4)
6.4. Effective tension in the conveyor belt (4)

Formula sheet

1. **Pumping system**
   Major losses in a pipe

$$H_f = f \frac{L}{D} \frac{V^2}{2g}$$

Where f= friction factor, L length (m), Q (flow rate), D= pipe diameter (m),

2. **Conveyor belt**

Power to overcome Friction

$P_f = F_\mu \times v$

F_μ = developed frictional force from the pulley to drive the belt (N)

v = belt linear speed (m/s)

Belt tension ratio

$T2 / T1 = e^{\mu\theta}$

μ = friction coefficient between belt and pulley
θ = wrap angle