



UNIVERSITY
OF
JOHANNESBURG

PROGRAMS : NATIONAL DIPLOMA
MINING ENGINEERING

SUBJECT : **MINE ENGINEERING 3**

CODE : **MEG3211**

ASSESSMENT : **EXAM**

DATE : 15 November 2019

DURATION : (SESSION 1) 08:30 - 11:30

WEIGHT : 60%

TOTAL MARKS : 87

ASSESSOR : Mr. AMULI BUKANGA

MODERATOR: Dr. SHANIEL DAVRAJH

NUMBER OF PAGES:

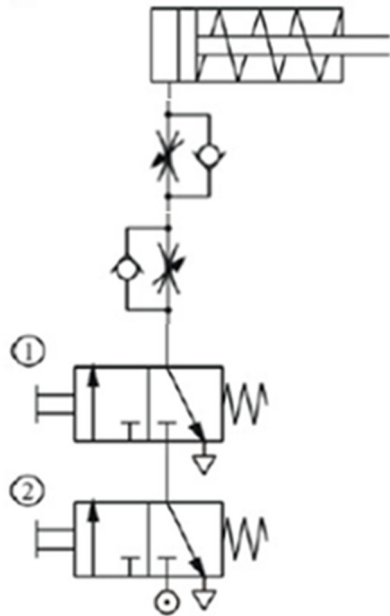
INSTRUCTIONS

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

Question 1

1.1. Give the advantages of pneumatic systems (8)

1.2. Explain briefly the working principle of the pneumatic system below (8)



Question 2

With the aid of a neat sketch explain briefly the principle of auto-transformer starting method for 3-phase induction motors (8)

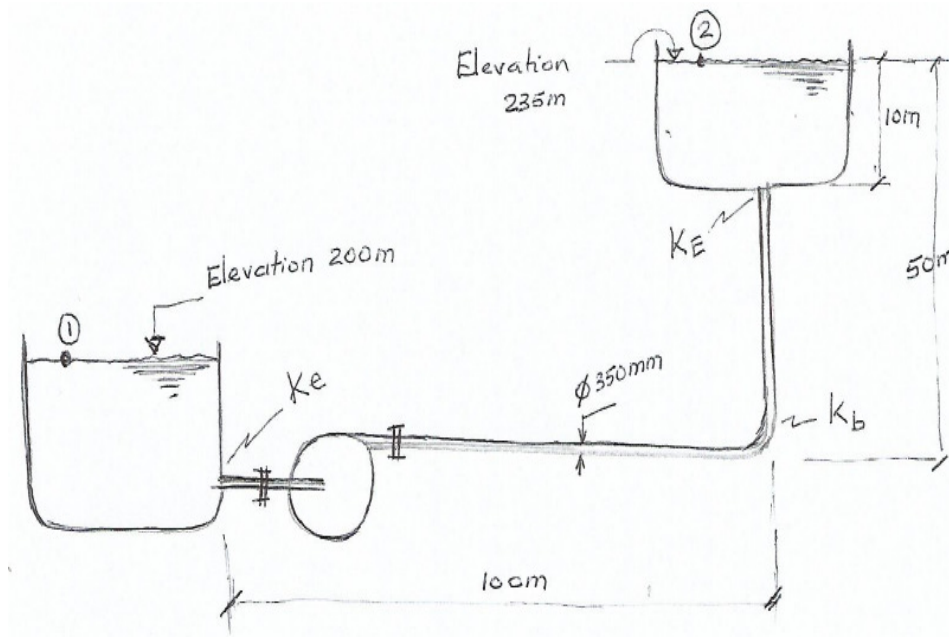
Question 3

With the aid of a neat sketch label clearly the components of a refrigeration system (8)

Question 4

Calculate the power for a pump pumping water through a steel pipe from one tank to another (see below figure). The pipe diameter is $D = 350\text{mm}$, water flow rate $Q = 0.314\text{ m}^3/\text{s}$ and the coefficient K for different fittings and other physical factors are:

- Pipe entrance $K_e = 0.03$
- Pipe expansion (exit) $K_E = 0.85$
- Pipe bend $K_b = 0.28$
- Kinematic viscosity of water $= 10^{-6}\text{m}^2/\text{s}$
- Pipe roughness $\epsilon = 0.046\text{ mm}$



(26)

Question 5

A 300 kVA transformer has a primary winding resistance of 0.4Ω and a secondary winding resistance of 0.0015Ω . The iron loss is 2kW and the primary and secondary voltages are 4kV and 200V respectively.

If the power factor of the load is 0.78, calculate the efficiency of the transformer on full load

(13)

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	225°
Incline angle	17°
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

$$P = F_{\mu} \times v$$

F_{μ} = developed frictional force from the pulley to drive the belt (N)

v = belt linear speed (m/s)

Belt tension ratio

$$T_2 / T_1 = e^{\mu\theta}$$

μ = friction coefficient between belt and pulley

θ = wrap angle

