



UNIVERSITY
OF
JOHANNESBURG

PROGRAMS : BEng. Tech
MINING ENGINEERING

SUBJECT : **MINE EQUIPMENT 2B**

CODE : **MEQMNB2**

ASSESSMENT : **EXAM**

DATE : 20 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: **05**

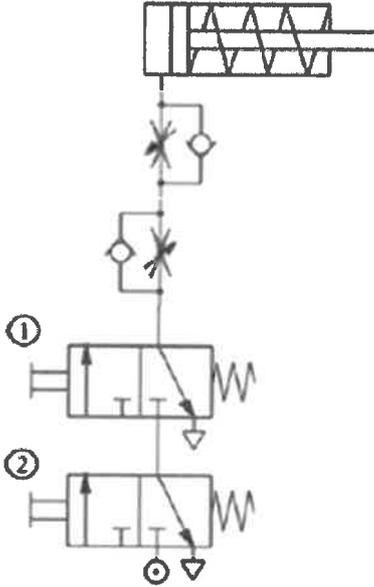
INSTRUCTIONS

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)

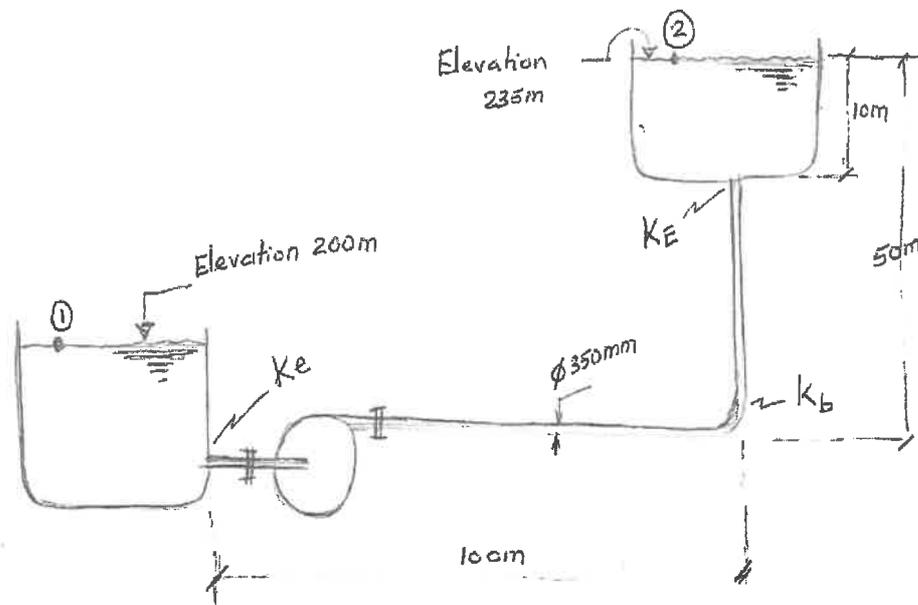
Question 3

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 2 kW and the primary and secondary voltages are 4 kV and 200 V 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

$$P_f = F_\mu \times v$$

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

