UNIVERSITY OF JOHANNESBURG

PROGRAM:	Beng. Tech MINING ENGINEERING
SUBJECT:	**MINE ENGINEERING 2A** **SUPPLEMENTARY**
CODE:	**MINMNA2**
DATE:	2018
DURATION:	3 Hours
WEIGHT:	
TOTAL MARKS	**96**

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NUMBER OF PAGES: 04

INSTRUCTIONS

1. ANSWER ALL QUESTIONS
2. CELLPHONES MUST BE SWITCHED OFF
3. ONLY ONE STANDARD CALCULATOR ALLOWED PER STUDENT

Question 1

With regards to single phase alternating voltage explain briefly the difference between the following:

1.1. Inductance and capacitance (5)
2.1. Resistance and impedance (5)

Question 2

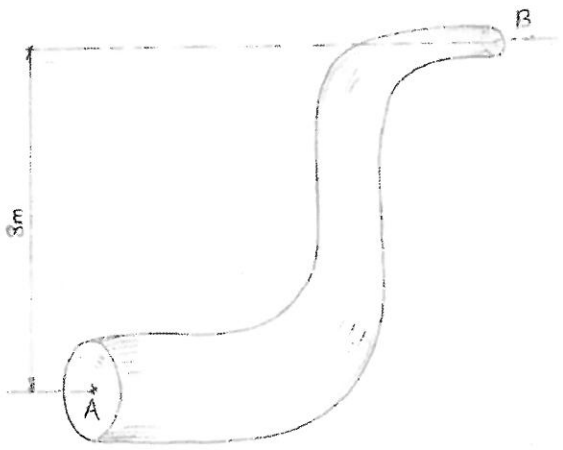
A coil of inductance 318.3mH and negligible resistance is connected in series with a 200Ω resistor to a 240 V, 50 Hz supply.
Calculate the following
2.1. Inductive reactance of the coil (4)
2.2. Impedance of the circuit (4)
2.3. Current in the circuit (4)
2.4. Potential difference across each component (4)

Question 3

Water flows through the pipe at the rate of 30 litres/s. The absolute pressure at point A is 200kPa, and the point B is 8 m higher than point A. The lower section of pipe has a diameter of 16 cm and the upper section narrows to a diameter of 10cm.

Find the velocities of the stream at points A and B. (8)

Hint: use Bernoulli principle at points A and B



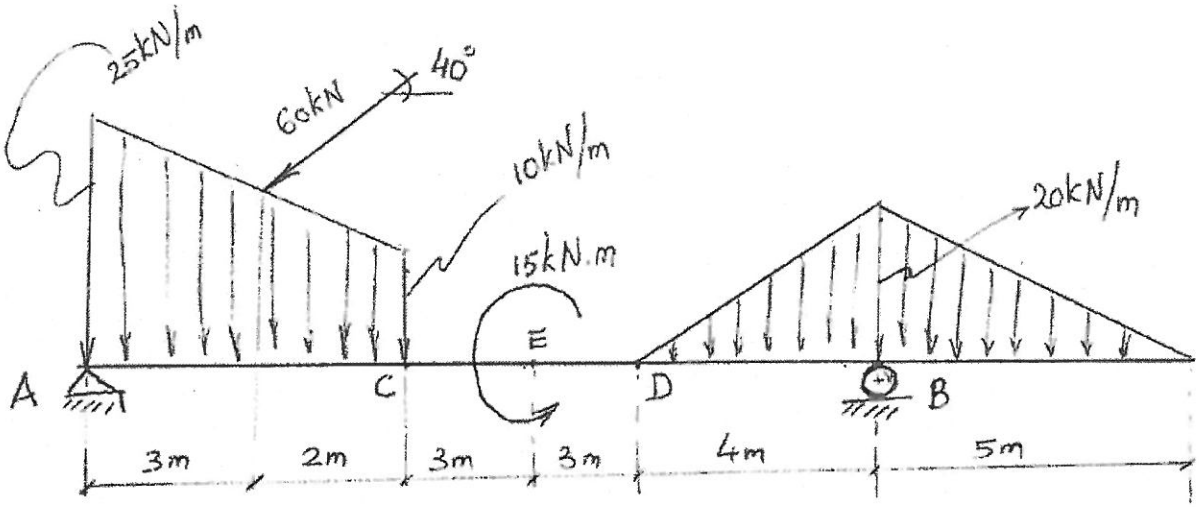
Question 4

A miner having a mass of 80 kg is standing in the mine cage. Determine the reaction force between the miner and the floor of the cage during the following:

4.1. Initial period of acceleration (4)
4.2. Period of constant speed travel (4)
4.3. Final retardation period (4)

Question 5

Determine the reactions (magnitude and direction) of supports A and B for the following structure (20)



Question 6

In an air standard Otto cycle, the compression ratio is 7 and the compression begins at 35°C and 100KPa. The maximum temperature of the cycle is 1373K.

6.1. Draw and label the full cycle. All your calculation results obtained below must clearly appear on the diagram (that must be of an acceptable scale, minimum half a page) (6)

Calculate the:

6.2. Temperature at points 2 and 4 in the cycle (6)
6.3. Pressure at various points 2, 3 and 4 in the cycle (9)
6.4. Heat supplied per kg of air (3)
6.5. Work done per kg of air (3)
6.6. Cycle efficiency (3)

Formula sheet

Depending on the nature of the cycle
Adiabatic process PV^{γ} = Constant or $TV^{\gamma-1}$ = Constant
Perfect gases PV = m RT
Heat exchanged = $C_V * \Delta T$
Heat exchanged = $C_P * \Delta T$
Where:
ΔT = final temperature – initial temperature
r = compression ratio
P= pressure (N/m^2)
V= volume (m^3)
T= temperature (K)
M= mass of the gas (kg)
R= constant of gas = 0.287kJ/kg.K