



**PROGRAM:** Beng. Tech  
MINING ENGINEERING

**SUBJECT:** MINE ENGINEERING 2A  
**SUPPLEMENTARY**

**CODE:** MINMNA2

**DATE:** 18 July 2019

**DURATION:** 3 Hours

**WEIGHT:**

**TOTAL MARKS** 94

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**NUMBER OF PAGES: 03**

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**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)
- 1.2. Resistance and impedance (5)

## Question 2

A  $20\Omega$  resistor is connected in series with a coil of inductance  $80\text{mH}$ . The combined circuit is connected to a  $200\text{V}$ ,  $50\text{Hz}$  supply. Calculate:

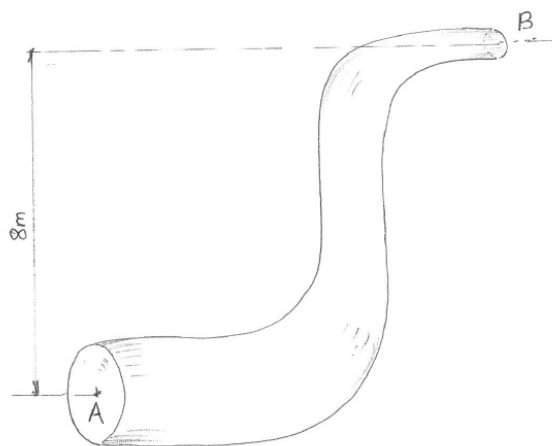
- 2.1. The reactance of the coil (4)
- 2.2. Impedance of the circuit (4)
- 2.3. Current in the circuit (4)
- 2.4. Power factor of the circuit (4)
- 2.5. Power absorbed by the circuit
- 2.6. Value of the capacitance to connect in parallel in order to correct the power factor to 0.9 (6)

## Question 3

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

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

Hint: use Bernoulli principle at points A and B



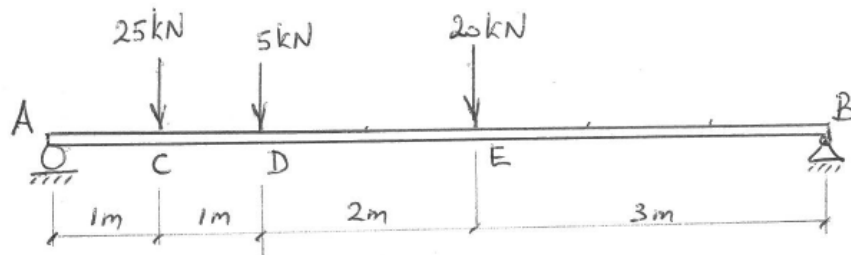
## Question 4

- 4.1. State what type of gearing system is used to convert rotary motion into translating motion (2)
- 4.2. Give using your own words the similarity and the difference between clutching and braking system (3)

## Question 5

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

- 5.1. Calculate the reactions of supports (8)
- 5.2. Determine the shear forces and bending moments at A, B, C, D and E (10)
- 5.3. Draw the moment and shear force diagrams (10)



## Question 6

A fluid system, contained in a piston and cylinder machine, passes through a complete cycle of four processes. The sum of all heat transferred during a cycle is  $-3400\text{J}$ . The system completes 120 cycles every hour.

- 6.1. Complete the following table calculating the values A, B, C, D, E and F show your calculations for each item (18)
- 6.2. Compute the net rate of work output in kW. (3)

Process	Q (kJ/min)	W(kJ/kg)	$\Delta U$ (kJ/min)
1-2	0	434	D
2-3	4200	0	E
3-4	-420	B	-7320
4-5	A	C	F