

## PHYSICS (5 QUESTIONS)

### N°1 MECANICS

A father pulls his child on a sled using a rope along a slope inclined at  $18.5^\circ$  to the horizontal.

The child has a mass of 15 kg and the sled has a mass of 1.2 kg.

The coefficient of static friction between the sled and the snow is 0.25, and the coefficient of kinetic friction is 0.15.

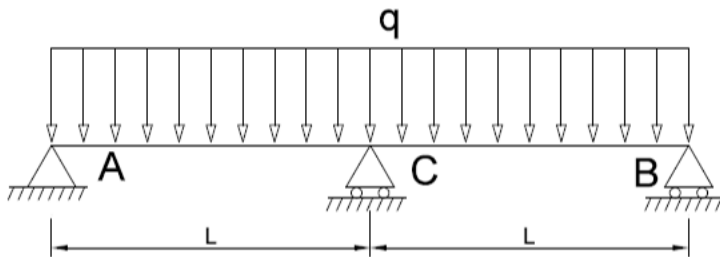
The rope makes an angle of  $25^\circ$  with the slope.

What is the minimum tension in the rope required to prevent the sled from sliding down the slope?

- a- 16 N
- b- 56 N
- c- 75 N
- d- 87 N

### N°2 RDM

We study the continuous beam defined by the following diagram:



The connection at A is a pinned joint.

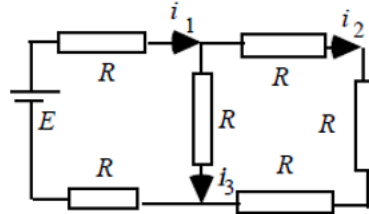
The connections at B and C are simple supports (roller supports).

Which of the following statements is correct?

- a) The beam is statically determinate (isostatic).
- b) The beam is statically indeterminate of degree 1.
- c) The beam is statically indeterminate of degree 2.
- d) The beam is not in equilibrium.

### N°3 ELECTRICITY

What is the current  $i_1$  for  $E=11\text{ V}$  and  $R=40\ \Omega$  in the following circuit?



- a-  $i_1 = 100\text{ mA}$
- b-  $i_1 = 46\text{ mA}$
- c-  $i_1 = 92\text{ mA}$
- d-  $i_1 = 25\text{ mA}$

### N°4 ELECTROTECHNIC

A three-phase load absorbs:  $P = 6\text{ kW}$ ;  $\cos\phi = 0,75$ . What is the apparent power?

- a- 4,5 kVA
- b- 6 kVA
- c- 8 kVA
- d- 7,5 kVA

### N°5 THERMODYNAMIC / THERMIC

One mole of gas is at  $20^\circ\text{C}$  under a pressure of 20 atm.

The gas undergoes an isothermal expansion until it reaches a final pressure of 1 atm.

( $R = 0.082\text{ atm L mol}^{-1}\text{K}^{-1}$ ).

What is the work exchanged by the gas:

- a-  $W = -10.5\text{ kJ}$
- b-  $W = \underline{10.5\text{ kJ}}$
- c-  $W = 7.3\text{ kJ}$
- d-  $W = -7.3\text{ kJ}$