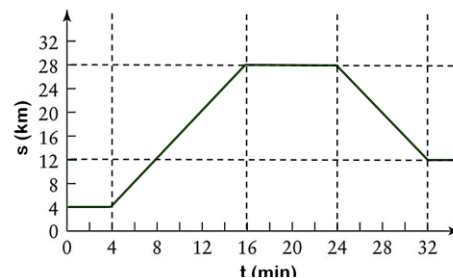# 1. izpit iz fizike - 22. 1. 2020

1.) Vlak podzemne železnice se giblje tako kot prikazuje graf pozicije s v odvisnosti od časa. Privzemi, da se vlak giblje v 1D.

    a) Kolikšno hitrost ima vlak po $t = 12\ min$?

   b) Nariši časovno odvisnost hitrosti in izračunaj celotno pot d, ki jo vlak opravi.

2.) V homogenem magnetnem polju gostote B_0=0,05 T se nahaja tuljava s presekom *15 cm²* in *45* ovoji. Geometrijska os tuljave je poravnana s simetrijo magnetnega polja. Magnetno polje začnemo zmanjševati linearno s časom tako da se v vsaki sekundi zmanjša za *0,002 T*. Kolikšna napetost se inducira v tuljavi?
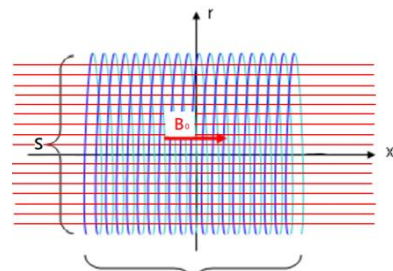
3.) Delavec ob gladek zid prisloni lestev in se povzpne do tretjine njene dolžine. Med lestvijo in zidom je lepenje zanemarljivo, med tlemi in lestvijo pa je koeficient lepenja 0.2. Masi delavca in lestve sta $80\ kg$ in $10\ kg$. Pri katerem naklonskem kotu α lestev zdrsne?
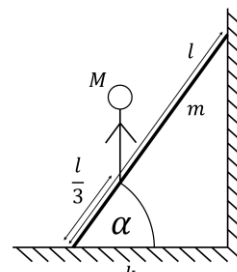
4.) Kondenzator (C = 100 μF), tuljavo (L = 100 mH) in upornik (R = 100Ω) vežemo, kot je prikazano na sliki. Vezje priključimo na vir izmenične napetosti, z amplitudo 8 V in frekvenco 60 Hz. Kakšna je amplituda in fazni zamik napetosti na uporniku, glede na gonilno napetost? Kolikšna povprečna moč se troši na uporniku?
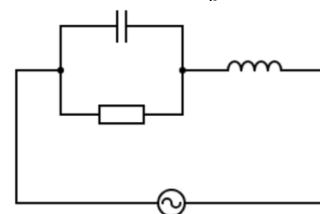
5.) V palici se gostota na dolžinsko enoto linearno povečuje z odmikom x $\varrho(x) = 2mx/l^2$. Z računom pokaži, da je vztrajnostni moment palice za vrtenje okoli težišča $x_t = 2l/3$ (os 2) enak $J_2 = ml^2/18$. Kolikšen pa je vztrajnostni moment J_1 za vrtenje okoli osi 1? Nato palico obesimo in dovolimo, da prosto niha okoli osi 1. Kolikšna je frekvenca nihanja, če so odmiki od ravnovesne lege majhni? Masa palice je $m = 1\ kg$ in dolžina palice je $L = 1\ m$.
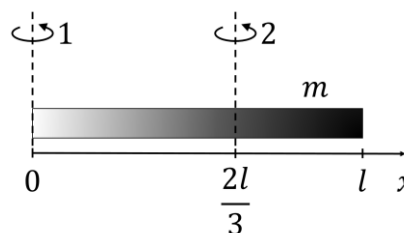
1.) The subway train moves as shown by the graph of the position s as a function of time. Assume 1D motion.
   a) What is the speed of the train after $t = 12\ min$?
   b) Plot the time dependence of subway's speed and calculate the entire distance d the train makes.
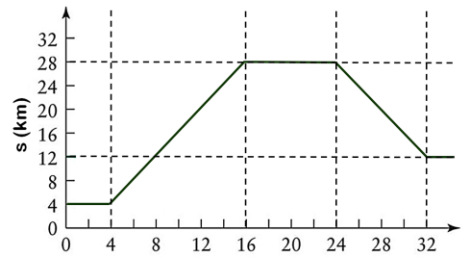
2.) In a homogeneous magnetic field of 0.05 T there is a coil with a cross section of 15 cm² and 45 loops. The geometric axis of the coil is aligned with the symmetry of the magnetic field. We begin to decrease the magnetic field linearly with time by decreasing 0.002 T each second. How much voltage is induced in the coil?
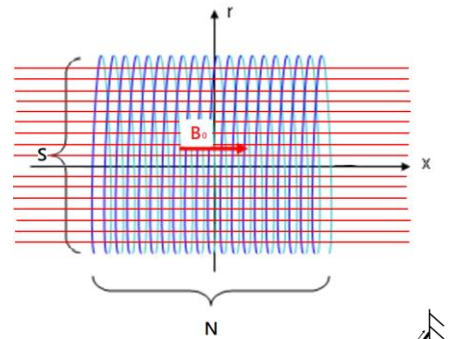
3.) A worker leans a ladder against a sleek wall and climbs it up to a third of its length. There is no static friction between the ladder and the wall, however between the floor and the ladder the coefficient of static friction is 0.2. The masses of the worker and the ladder are $80\ kg$ and $10\ kg$, respectively. At which incline angle α does the ladder slip?
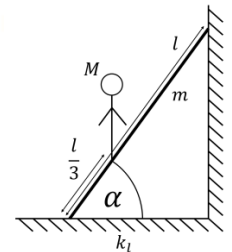
4.) Capacitor (C = 100 μF), solenoid (L = 100 mH) and resistor (R = 100Ω) form a circuit, as shown in figure. They are connected to an alternating current source, with the amplitude 8 V and frequency 60 Hz. What is the voltage amplitude and phase shift on the resistor, with respect to the source voltage? What is the average power dissipation on the resistor?
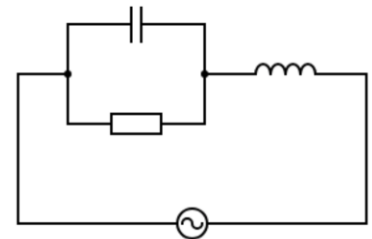
5.) Show that the moment of inertia around the center of mass at $x_t = 2l/3$ (axis 2) of a rod in which density per unit length is a linear function of x $\varrho = 2mx/l^2$ has a moment of inertia equal to $J_2 = ml^2/18$. What is the moment of inertia J_1 for rotation around axis 1? Then we hang the rod vertically so that it can freely rotate around axis 1. What is the frequency of oscillation of this pendulum when rotation is around axis 1? The mass of the rod is $m = 1\ kg$ and the length is $l = 1\ m$.