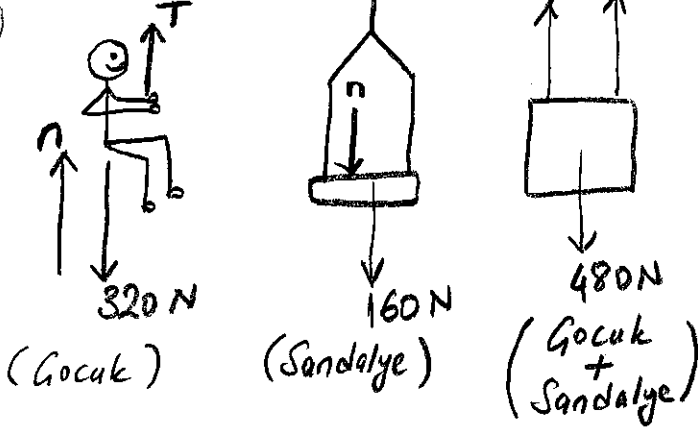


T.C.
ONDOKUZ MAYIS ÜNİVERSİTESİ
HAVACILIK ve UZAY BİLİMLERİ FAKÜLTESİ
Uçak ve Uzay Mühendisliği/Meteoroloji Müh. Bölümleri
Fizik 1 Final Sınavı Cevapları

CEVAP 1. a)

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b) Her ipteki gerilme $T = 250 \text{ N}$

$$\Sigma F = ma \Rightarrow 2T - 480 = ma$$

$$m = \frac{480}{9,80} = 49 \text{ kg}$$

$$2 \cdot 250 - 480 = 49a$$

$$a = 0,408 \text{ m/s}^2$$

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c) Çocuk için Newton'un 2. yasası

$$n + T - 320 = ma$$

$$m = \frac{320}{9,80} = 32,7 \text{ kg}$$

$$n + 250 - 320 = 32,7(0,408)$$

$$n = 83,3 \text{ N}$$

CEVAP 2.

- mekanik enerjinin korunumuna göre,

$$K_A + U_A = K_B + U_B$$

$$\frac{1}{2} m v_A^2 - \frac{GMm}{r_A} = \frac{1}{2} m v_B^2 - \frac{GMm}{r_B} \quad (1)$$

- Ağısal momentumun korunumu

$$L_A = L_B$$

$$m v_A r_A = m v_B r_B \rightarrow v_B = \left(\frac{r_A}{r_B}\right) v_A \quad (2)$$

(2) → (1)'de yazılırsa,

$$\frac{1}{2} v_A^2 - \frac{GM}{r_A} = \frac{1}{2} \left(\frac{r_A^2}{r_B^2} v_A^2\right) - \frac{GM}{r_B}$$

$$\frac{1}{2} v_A^2 \left[1 - \frac{r_A^2}{r_B^2}\right] = \frac{GM}{r_A} \left[1 - \frac{r_A}{r_B}\right]$$

$$\left(1 - \frac{r_A}{r_B}\right) \left(1 + \frac{r_A}{r_B}\right)$$

$$\Rightarrow \left(1 + \frac{r_A}{r_B}\right) = \frac{2GM}{r_A v_A^2} \quad (3)$$

$$r_A = R + 400 \text{ km} = 6370 + 400 = 6770 \text{ km}$$

$$r_A = 6770 \times 10^3 \text{ m}$$

$$v_A = 30000 \frac{\text{km}}{\text{h}} = 8,33 \cdot 10^3 \text{ m/s}$$

$$GM = 6,67 \cdot 10^{-11} \times 5,98 \cdot 10^{24} \approx 3,9 \cdot 10^{14} \text{ m}^3/\text{s}^2$$

Bu değerler (3)'de yerine yazılırsa

$$r_B = 10,4 \times 10^6 \text{ m} \text{ bulunur.}$$

$$\text{maks. yük.} = 10,4 \times 10^6 - R$$

$$= (10,4 \times 10^6 - 6370 \cdot 10^3)$$

$$\text{maks. yüks.} \approx 4 \times 10^6 \text{ m} = 4000 \text{ km}$$

(2)'den

$$v_B = \left(\frac{r_A}{r_B}\right) v_A = \left(\frac{6770 \text{ km}}{10400 \text{ km}}\right) 30000 \frac{\text{km}}{\text{h}}$$

$$v_B \approx 19529 \frac{\text{km}}{\text{h}} = 5,4 \times 10^3 \text{ m/s}$$

CEVAP 3. Newton'un 2. yasası

$$\Sigma F_r = ma_r = mv^2/r = m\omega_i^2 r \quad (v = r\omega)$$

(10P)

$$mg = m\omega_i^2 r \rightarrow \omega_i = \sqrt{g/r}$$

Agisal momentumun korunumu

$$I_i \omega_i = I_s \omega_s \quad (5) \quad (10P)$$

$$\left[5 \cdot 10^8 \text{ kgm}^2 + 150 \cdot 65 \text{ kg} \cdot (100 \text{ m})^2 \right] \left[\sqrt{g/r} \right] = I_s \omega_s$$

$$= \left[5 \cdot 10^8 + 30 \cdot 65 \cdot (100)^2 \right] \omega_s \quad (5)$$

$$\Rightarrow \omega_s = 1,12 \sqrt{g/r}$$

$$a_r = \omega_s^2 r = (1,12)^2 \frac{g}{r} r$$

$$a_r = 12,3 \text{ m/s}^2$$

CEVAP 4.

Orjini R'de seçelim.

$$\Sigma F_x = R \sin 15 - T \sin \theta = 0 \quad (1)$$

$$\Sigma F_y = 700 - R \cos 15 + T \cos \theta = 0 \quad (2)$$

$$\Sigma \tau = -700 \cos \theta (0,180) + T(0,07) = 0 \quad (3)$$

$$(3) \text{ den } T = 1800 \cos \theta$$

$$(1) \text{ den } R = \frac{1800 \sin \theta \cos \theta}{\sin 15}$$

$$(2) \text{ den } 700 - \frac{1800 \sin \theta \cos \theta \cos 15}{\sin 15} + 1800 \cos^2 \theta = 0$$

$$\Rightarrow \cos^2 \theta - 3,782 \sin \theta \cos \theta = 0$$

Karesi alınırsa,

$$\cos^4 \theta - 0,8809 \cos^2 \theta + 0,01013 = 0$$

$u = \cos^2 \theta$ olsun. Buna göre,

$$u = 0,01165 \text{ ve } 0,8693$$

$$\cos^2 \theta = 0,8693$$

$$\theta = \cos^{-1} \sqrt{0,8693} = 21,2^\circ$$

$$\rightarrow T = 1800 \cos \theta = 1800 \cos 21,2$$

$$T = 1,68 \times 10^3 \text{ N} \quad (4P)$$

$$\rightarrow R = \frac{1800 \sin \theta \cos \theta}{\sin 15}$$

$$= \frac{1800 \sin(21,2) \cos(21,2)}{\sin 15}$$

$$R = 2,34 \times 10^3 \text{ N} \quad (4P)$$