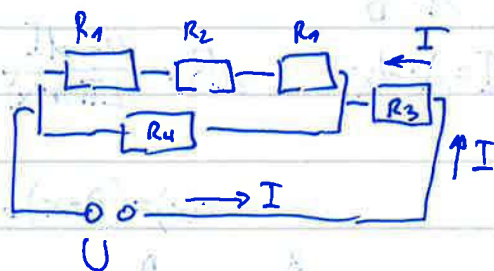


① $R_1 = 1\Omega$ a) $R_N = ?$
 $R_2 = 2\Omega$ b) $P_{R3} = ?$
 $R_3 = 3\Omega$ c) $I_{R4} = ?$
 $R_4 = 4\Omega$



$U = 7V$

a) $R_N' = R_1 + R_2 + R_3 = 4\Omega$

$\frac{1}{R_N''} = \frac{1}{R_N'} + \frac{1}{R_4} = \frac{1}{4\Omega} + \frac{1}{4\Omega} \rightarrow R_N'' = 2\Omega$

$R_N = R_3 + R_N'' = 3\Omega + 2\Omega = 5\Omega$ (5)

b) $I = \frac{U}{R_N} = \frac{7V}{5\Omega} = 1.4A$ $P_{R3} = R_3 \cdot I^2 = 5.88W$ (5)

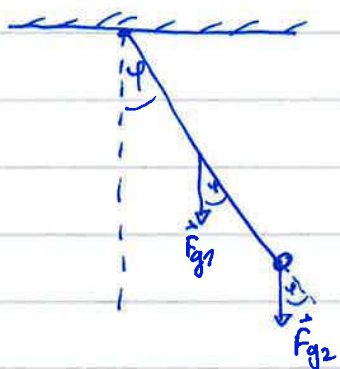
c) $U = U_{R3} + U_{R4}$, $U_{R4} = U - U_{R3} = U - R_3 \cdot I = 7V - 3\Omega \cdot 1.4A = 2.8V$ (5)

$I_{R4} = \frac{U_{R4}}{R_4} = 0.7A$ (5)

② $l = 4m$
 $m_p = 6kg$
 $m_u = 1kg$
 $\varphi_0 = 5^\circ$

a) $M = ?$

b) $\gamma = ?$



a) $\sum M_i = M_1 + M_2$

$M_i = r_i F_i \sin \varphi$ (5)

$M_1 = -\frac{l}{2} m_p g \sin \varphi$

$M_2 = -l m_u g \sin \varphi$

(5) $M = 13.7 N$ (ali 13.9 Nm)

b) $M = J\alpha$

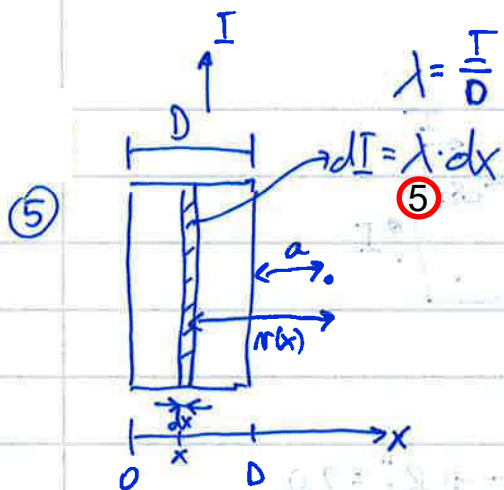
(5) $J = J_p + J_u = \frac{1}{3} l^2 m_p + m_u l^2$
 $\sin \varphi \approx \varphi, \varphi \ll 1$

$J\alpha = -lg(\frac{1}{2}m_p + m_u)\varphi$

$\alpha = -\frac{lg(\frac{1}{2}m_p + m_u)}{l^2(\frac{1}{3}m_p + m_u)}\varphi$ (5)
 ω^2

$\omega = \sqrt{\frac{g(\frac{1}{2} \cdot 6kg + 1kg)}{l(\frac{1}{3} \cdot 6kg + 1kg)}} = \sqrt{\frac{4}{3} \frac{g}{l}}$

$\gamma = \frac{1}{2\pi} \sqrt{\frac{4}{3} \frac{g}{l}} = 0.29 Hz$ (5)



$$\lambda = \frac{I}{D}$$

⑤

$$dI = \lambda \cdot dx$$

$$dB = \frac{\mu_0 dI}{2\pi r(x)} \quad \text{⑤}$$

$$r(x) = (D-x) + a \quad \text{⑤}$$

$$\int_0^B dB = \int_0^D \frac{\mu_0 \lambda dx}{2\pi ((D-x) + a)} = \frac{\mu_0 \lambda}{2\pi} \int_0^D \frac{dx}{D-x+a} \quad \text{⑤}$$

$$\lambda = \frac{I}{D}$$

$$B = \frac{\mu_0 \lambda}{2\pi} \int_0^D \frac{-du}{u} = \frac{\mu_0 I}{2\pi D} \ln \frac{D+a}{a} \quad \text{⑤}$$

$$u = D-x+a$$

$$du = -dx$$

$$B = 7.2 \cdot 10^{-6} \text{ T}$$