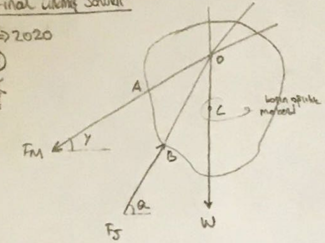
BİYOMEKANİK

Final Çıkmış Sorular

⇒ 2020

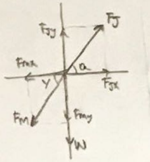
① Omuz



$m = 7kg$, $F_m = 766N$, $Y = 48$

$\alpha = ?$ $F_J = ?$

$W = (9.81)\,7kg = 68.67N$



$F_{mx} = F_m \cos Y = 766N \cos 48 = 512.55$

$F_{my} = F_m \sin Y = 766N \sin 48 = 569.25$

$F_{Jx} = F_J \cos \alpha$

$F_{Jy} = F_J \sin \alpha$

$\Sigma F_x = 0$

$F_{Jx} = F_{mx}$

$F_{Jx} = 512.55N$

$\Sigma F_y = 0$

$F_{Jy} - F_{my} - W = 0$

$F_{Jy} = F_{my} + W$

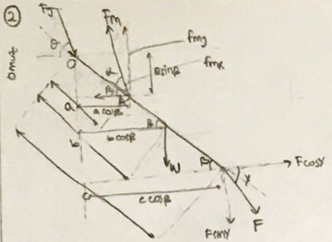
$F_{Jy} = 569.25N + 68.67N$

$F_{Jy} = 637.92$

$F_J = \sqrt{F_{Jx}^2 + F_{Jy}^2} = \sqrt{512.55^2 + 637.92^2} = 818.32$

$\tan \alpha = \frac{F_{Jy}}{F_{Jx}} \Rightarrow \alpha = \tan^{-1}\left(\frac{637.92}{512.55}\right) = 51.22$

② Omuz



$a = 15cm$, $b = 31cm$, $c = 65cm$

$F = 77N$, $W = 146N$, $\beta = 27°$, $\gamma = 32°$, $\alpha = 29°$

a) Fm kas kuvvetini hesaplayınız $F_m = ?$

b) Eklem tepki kuvvetinin yatayla yaptığı θ açısını hesaplayınız. $\theta = ?$

c) Eklem tepki kuvveti Fj'yi hesaplayınız. $F_J = ?$

$f_{mx} = f_m \cos(\alpha + \beta)$

$f_{my} = f_m \sin(\alpha + \beta)$

$\circlearrowleft + \Sigma M_o = 0$

$(a.\cos\beta) F_{my} - a \sin\beta F_{mx} - (b \cos\beta) W - (c \cos\beta)(F \sin\gamma) = 0$

$(a.\cos\beta) F_m \sin(\alpha+\beta) - (a \sin\beta) F_m \cos(\alpha+\beta) - (b \cos\beta) W - (c \cos\beta)(F \sin\gamma) = 0$

$$F_m = \frac{(bW + c(F\sin\gamma))\cos\beta}{a[\cos\beta \sin(\alpha+\beta) - \sin\beta \cos(\alpha+\beta)]}$$

$$F_m = \frac{(bW + c(F\sin\gamma))\cos\beta}{a.\sin\alpha}$$

$$F_m = \frac{[31cm(146N) + 65cm(77N \sin 32)]\cos 27}{15cm \sin 29}$$

$F_m = 879.50$

$\Sigma F_x = 0$

$+F_{Jx} - F_{mx} = 0$

$F_{Jx} = F_m \cos(\alpha + \beta)$

$F_{Jx} = 879.5 \cos(29 + 27)$

$F_{Jx} = 491.81$

$\Sigma F_y = 0$

$F_{my} - F_{Jy} - W - F \sin\gamma = 0$

$F_{Jy} = F_{my} - W - F \sin\gamma$

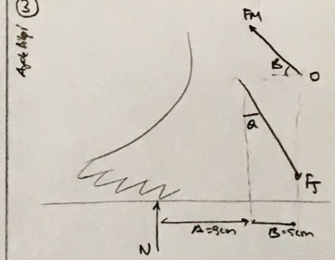
$F_{Jy} = 879.5 \sin 56 - 146 - 77.\sin 32$

$F_{Jy} = 542.33$

$F_J = 732.12$

$\theta = 47.8$

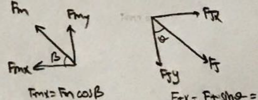
③ Ayak bileği



$m = 85kg$, $B = 5cm$, $A = 9cm$, $\alpha = 38$

$F_J = ?$, $\beta = ?$, $F_m = ?$

$W = 85kg\,(9.81) = 833.85N$ $\quad N = \frac{W}{2} = \frac{833.85}{2} = 416.925$



$F_{mx} = F_m \cos\beta$

$F_{my} = F_m \sin\beta$

$F_{Jx} = F_J \sin\theta = 1481.44N \sin 38 = 912.065$

$F_{Jy} = F_J \cos\theta = 1481.44N \cos 38 = 1167$

$\circlearrowleft + \Sigma M_o = 0$

$N(14cm) - F_{Jy}(5cm) = 0$

$416.925N(14cm) = F_J \cos 38 (5cm)$

$F_J = 1481.44N$

$\Sigma F_x = 0$

$F_{Jx} - F_{mx} = 0$

$F_J \sin\theta = F_m \cos\beta$ (1)

$\Sigma F_y = 0$

$F_{my} - F_{Jy} + N = 0$

$F_m \sin\beta = F_J \cos\theta - N$ (2)

①② $\Rightarrow \frac{F_m \sin\beta}{F_m \cos\beta} = \frac{F_J \cos\theta - N}{F_J \sin\theta}$

$\beta = \tan^{-1}\left(\frac{1167 - 416.925}{912.065}\right)$

$\beta = 39.43$

① $\Rightarrow$ $912.065 = F_m \cos 39.43$

$F_m = 1180.87$