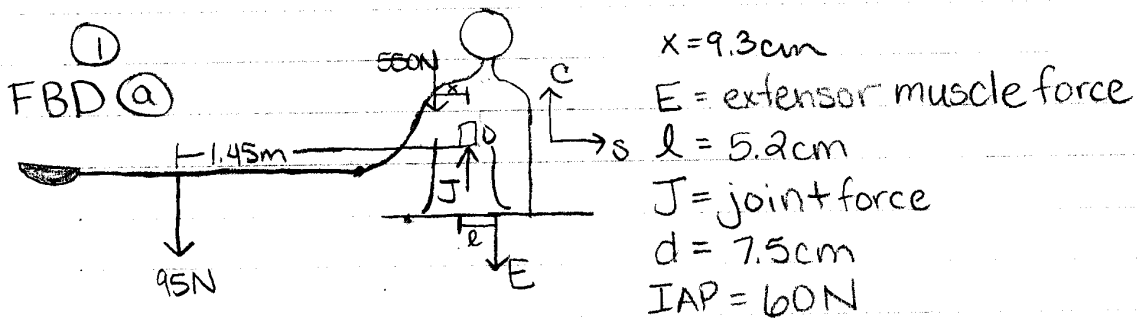


KIN 412/512 Fall 2005 Problem Set 2 Solutions



$$\sum M_D = 95(1.45) + 550(0.093) - E(0.052) = 0$$

$$E = \frac{95(1.45) + 550(0.093)}{0.052}$$

$$E = 3632.692308$$

$$E = 3630\text{ N}$$

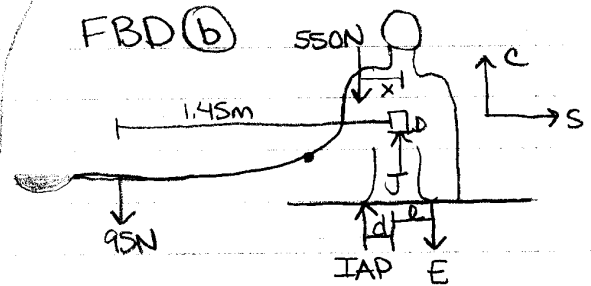
$$\sum F_s = 0 = J_s$$

$$\sum F_c = 0 = -95 - 550 - E + J$$

$$J_c = 95 + 550 + E$$

$$J_c = 4277.692308$$

$$J_c = 4280\text{ N} = J$$



$$\sum M_D = 95(1.45) + 550(0.093) - E(0.052) - 60(0.075)$$

$$E = \frac{95(1.45) + 550(0.093) - 60(0.075)}{0.052}$$

$$E = 3546.153846$$

$$E = 3550\text{ N} \quad 86.5\text{ N decrease}$$

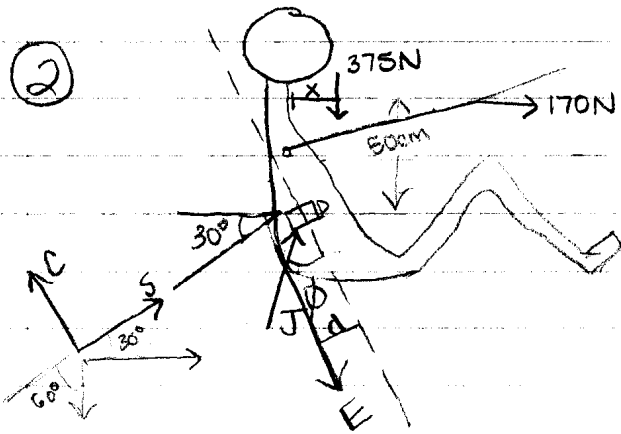
$$\sum F_s = 0 = J_s$$

$$\sum F_c = 0 = -95 - 550 + 60 - E + J_c$$

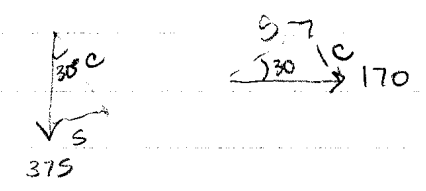
$$J_c = 4131.153846$$

$$J_c = 4130\text{ N} = J \quad 147\text{ N decrease}$$

The IAP slightly decreases both the J & E forces by 3.4% & 2.4% respectively.
 147N 86.5N



$x = 8\text{cm}$
 $d = 5.5\text{cm}$



$$\sum M_D = 0 = -375(8) - 170(50) + E(5.5)$$

$$E = \frac{375(8) + 170(50)}{5.5}$$

$$E = 2090.909091$$

$$\boxed{E = 2090\text{N}}$$

$$\sum F_s = 170(\cos 30) - 375\cos 60 + J_s = 0$$

$$J_s = 375\cos 60 - 170\cos 30$$

$$J_s = 40.27568136$$

$$\boxed{J_s = 40.3\text{N}}$$

$$\sum F_c = -170\sin 30 - 375\sin 60 - E + J_c = 0$$

$$J_c = 170\sin 30 + 375\sin 60 + E$$

$$J_c = 2500.668617$$

$$\boxed{J_c = 2500\text{N}}$$

$$|J| = \sqrt{J_c^2 + J_s^2} = 2500.992936$$

$$\boxed{J = 2500\text{N}}$$

$$\tan \phi = J_s / J_c$$

$$\phi = \tan^{-1}(J_s / J_c) = \boxed{0.923^\circ}$$