

國立高雄應用科技大學
九十七學年度碩士班招生考試
應用工程科學研究所

准考證號碼 (考生必須填寫)

靜力學

試題 共 6 頁，第 1 頁

- 注意：a. 本試題共 5 題，每題 20 分，共 100 分。
b. 作答時不必抄題。
c. 考生作答前請詳閱答案卷之考生注意事項。

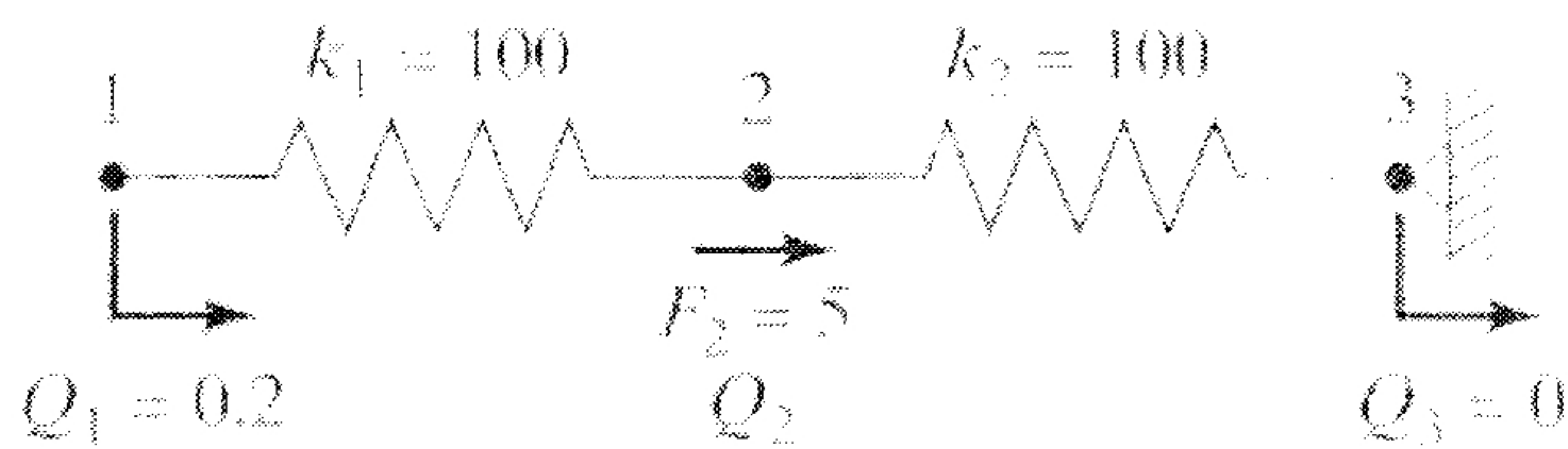
1. Consider the spring system shown in the figure. Find the equilibrium state of the system. (20%)

Hint : The equilibrium state is determined by solving :

$$\text{Minimize } \pi = \frac{1}{2} \times 100 \times (Q_2 - Q_1)^2 + \frac{1}{2} \times 100 (Q_3 - Q_2)^2 - 5Q_2$$

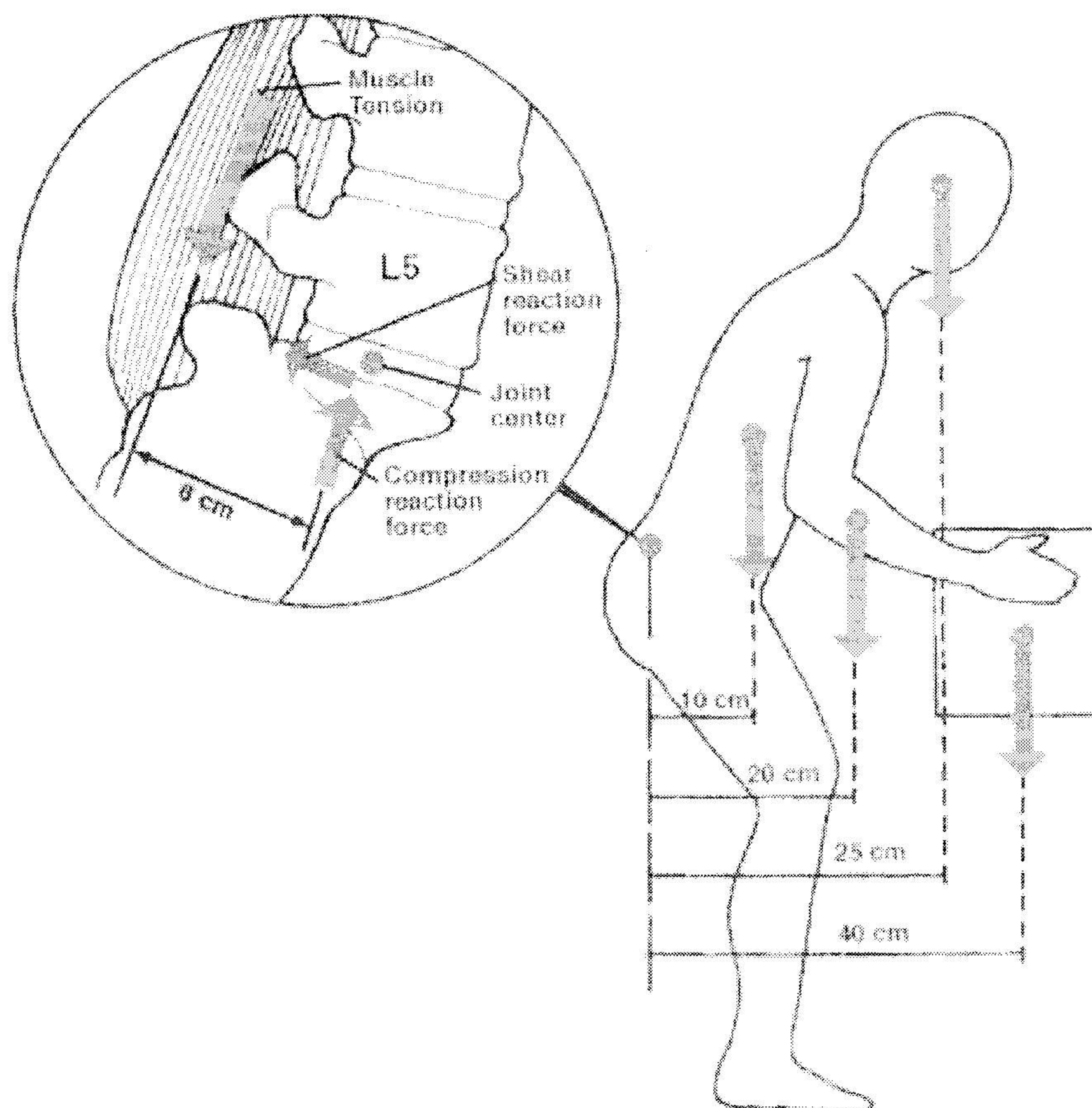
$$\text{Subject to } Q_1 = 0.2 \quad ; \quad Q_3 = 0$$

Where π represents the potential energy in a spring system and Q_i are displacements of the nodes in the system.

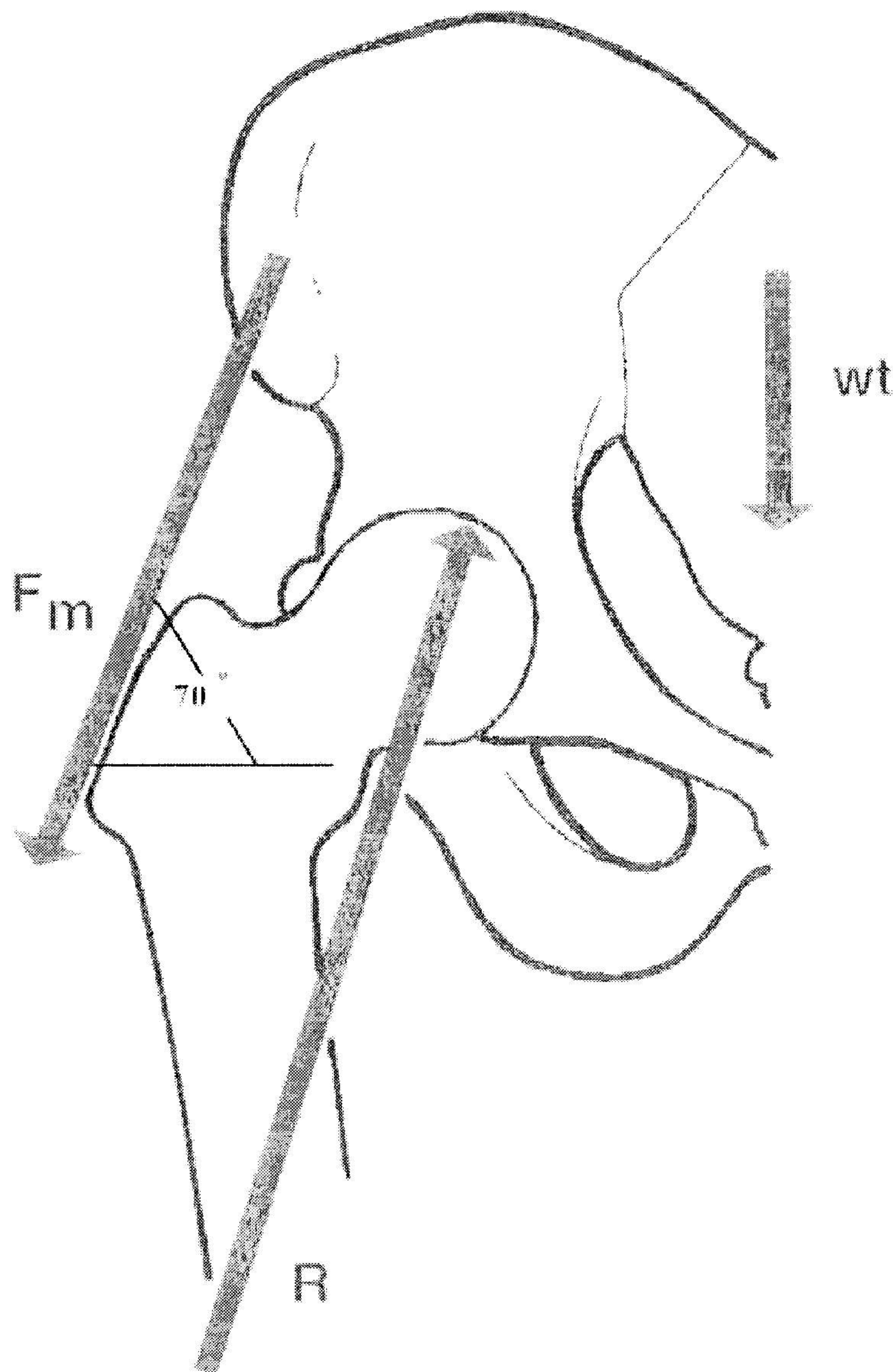


2. How much tension must be developed by the erector spinae with a moment arm of 6 cm from the L5, S1 joint center to maintain the body in the position shown below?
(Segment weights are approximated for a 600 N (135 lb) person.) (20%)

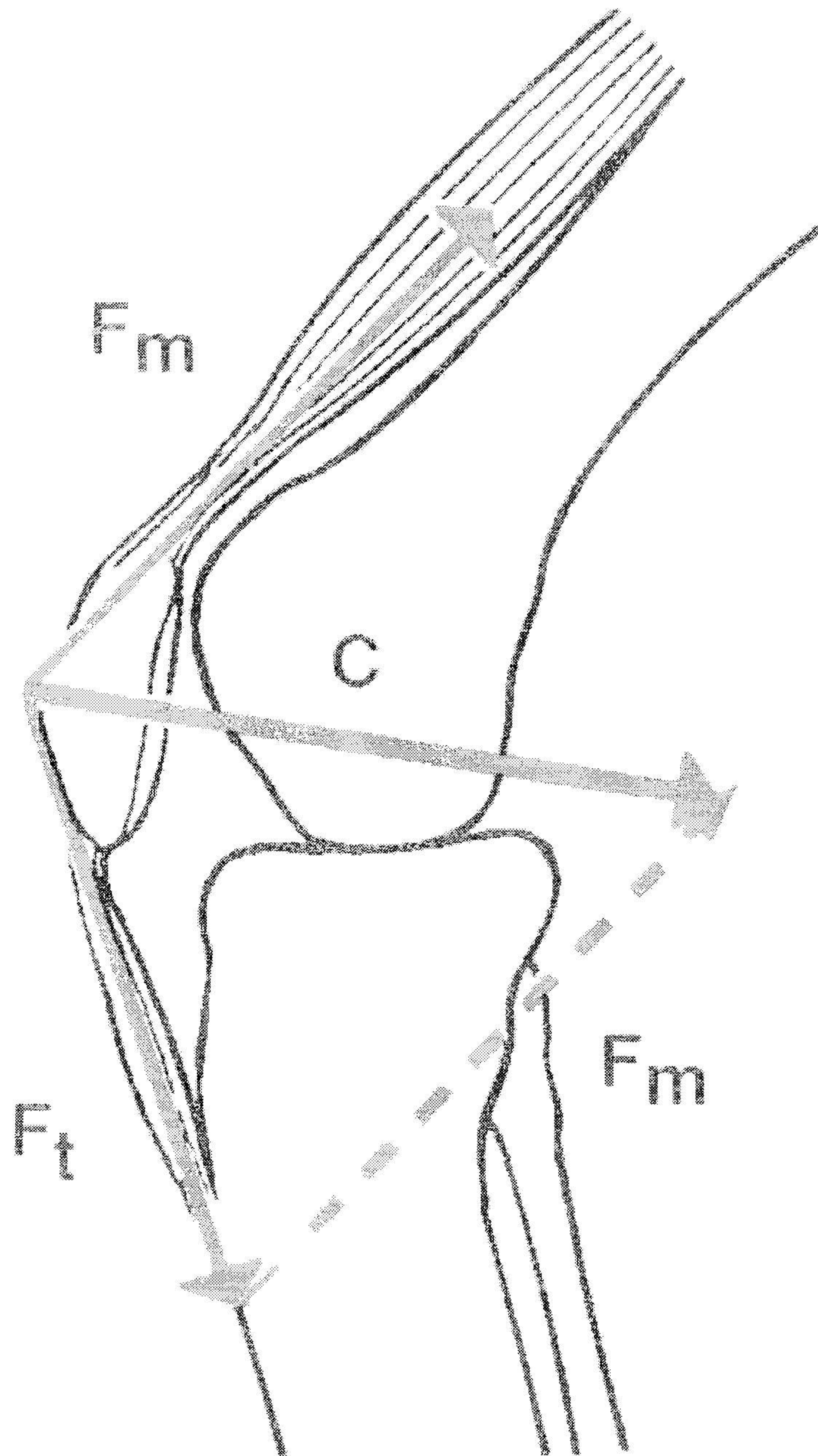
Segment	Wt	Moment arm
Head	50 N	25 cm
Trunk	280 N	10 cm
Arms	65 N	20 cm
Box	100 N	40 cm
F_m		6 cm



3. How much compression acts on the hip during two-legged standing, given that the joint supports 250 N of body weight and abductor muscles are producing 600 N of tension? ($wt = 250\text{ N}$, $F_m = 600\text{ N}$) (20%)



4. How much compression acts on the patellofemoral joint when the quadriceps exert 300 N of tension and the angle between the quadriceps and the patellar tendon is (a) 160° , and (b) 90° ? ($F_m = F_t = 300$ N) (20%)



5. The coefficient of static friction between a sled and the snow is 0.18, with a coefficient of kinetic friction of 0.15. A 250 N boy sits on the 200 N sled. How much force directed parallel to the horizontal surface is required to start the sled in motion? How much force is required to keep the sled in motion? (20%)