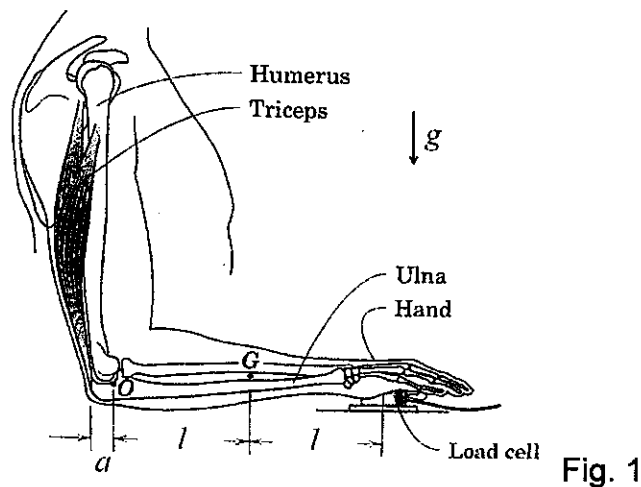


※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. A load cell is used to evaluate the strength of the triceps muscle of a patient as shown in Fig. 1. Determine the vertical tensile force F generated by the triceps muscle. Assume the mass of lower arm is m with mass center at G and the load-cell reading is P . (10%)



2. For a gait analysis, a camera-based system is usually used. By placing external markers on the subject's body segments, the marker trajectories are then monitored by the motion capture cameras.
- Describe what data are usually provided for clinical interpretations? (8%)
 - What are the two major phases in a gait cycle and what action is used to divide the two phases? (6%)
 - To study the 3D lower limb kinematics (thigh and shank), draw and indicate where the markers should be placed to create a six-degree-of-freedom model? (Hint: thigh marker clusters, shank marker clusters, knee epicondyle marker and ankle malleolus marker) (8%)
3. Describe the basically anatomical structure of blood vessels (artery, vein, microcapillary), and how the mass transport of water and solutes are regulated in the human cardiovascular system. (18%)
4. (a) Draw and describe the *Hill model of muscle*, which contains parallel elastic, series elastic and contractile elements. (12%)
- (b) Draw and describe the isometric force-length and isotonic force-velocity relations for the contractile component. (12%)
5. In the artery of a healthy subject, the pulsatile flow will lead to intricate wave propagations.
- Describe the change of wave speed in young and senior people according to the *Moens-Korteweg* equation. (10%)
 - Describe the wave forms of flowrate and pressure when the wave-reflection phenomenon is considered. (8%)
 - Discuss how undulated waves are damped in the arteries by the *Windkessel Effect*. (8%)