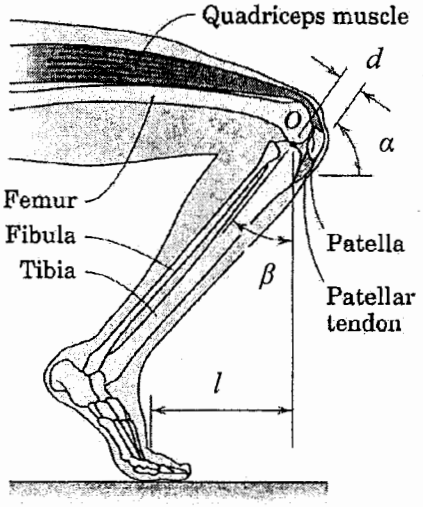
系所組別：生物醫學工程學系甲組

考試科目：工程力學 考試日期：0223，節次：1

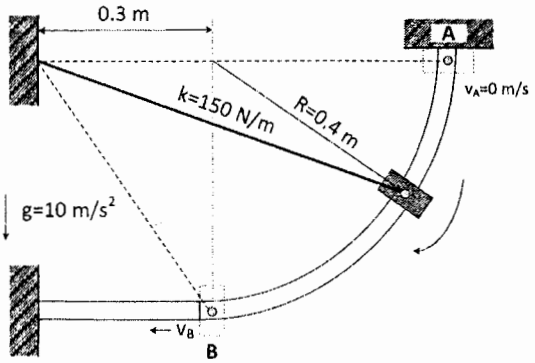
※ 考生請注意：本試題不可使用計算機

1. Assume moments of inertia, I_x, I_y, and product of inertia, I_{xy}, are known, determine the principle axes and the maximum and minimum moments of inertia. (9%) Draw the "Mohr's Circle" and provide a physical interpretation. (6%)

2. The figure below indicates an instantaneous moment when a person begins to slowly rise from a squatting position as his weight ***W*** equally distributed on both feet. Determine, at this moment, the tensile force ***F*** in the patellar tendon and the magnitude of the force reaction at point ***O***, which is the contact area between the tibia and the femur. Note that the line of action of the patellar tendon force is along its midline. Neglect the weight of the lower legs. (22%)



3. A 5-kg mass is released from rest at point A and slides with negligible friction in a vertical plane along the circular rod. The attached elastic rope has a stiffness of 150 N/m and has an unstretched length of 0.3 m. Determine the velocity of the mass as it passes point B. (20%)



(背面仍有題目,請繼續作答)

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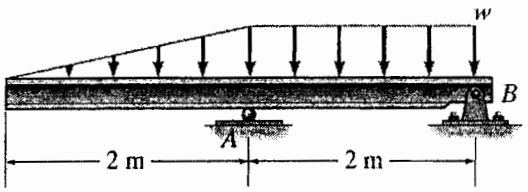
4. The beam will fail when the maximum moment is M_{max} 50 kN·m or the maximum shear is V_{max}=40 kN. Determine the largest intensity *w* of the distributed load the beam will support and draw the shear and moment diagrams. Note that the significant points must be explicitly indicated in the diagrams. (25%)



5. The small sphere of mass ***m*** is mounted (no sliding) on the light rod pivoted at *O* and supported at end *A* by the vertical spring of stiffness ***k***. End *A* is displaced downward a small distance below the horizontal equilibrium position and released. (a) Derive the differential equation for small oscillations of the rod and (b) determine the expression for the frequency in terms of *m*, *k*, *b* and *l*. (18%)