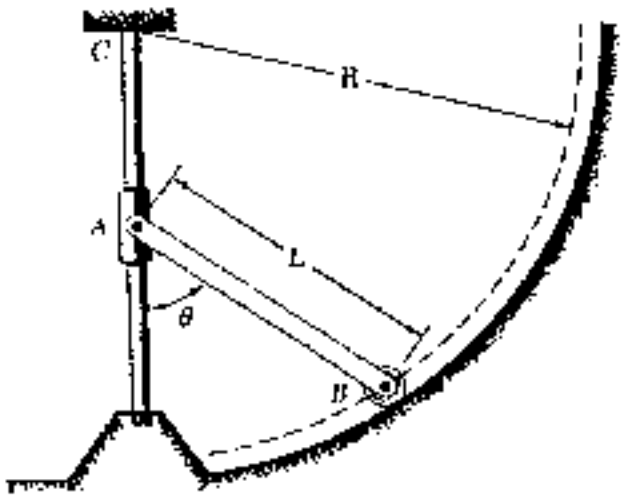
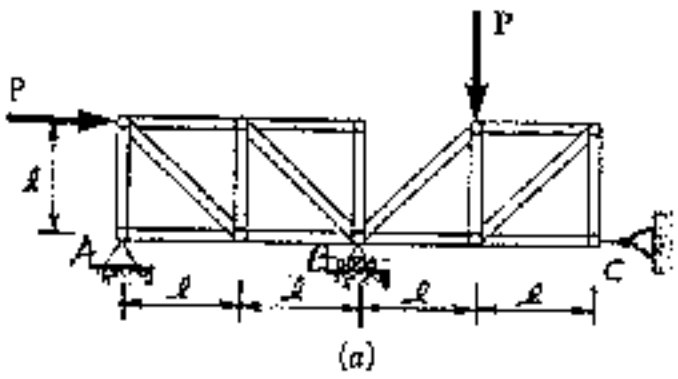
八十五學年度材料科學工程研究所(系)(所) 甲乙丙 組碩士班研究生入學考試

工程力學(I) 科號 2201 2401 共 2 頁第 1 頁 *請在試卷【答案卷】內作答

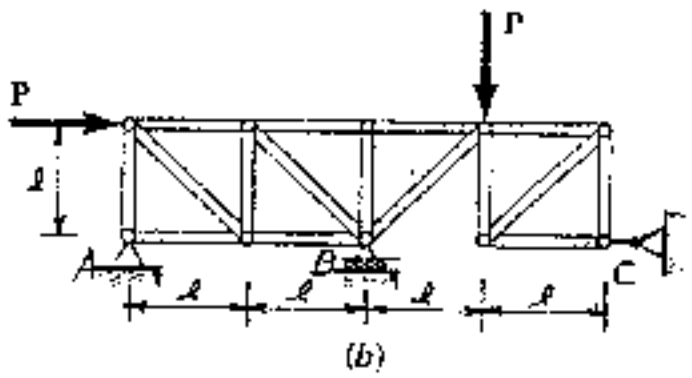
A slender rod of length L and weight W is attached to a collar at A and is fitted with a small wheel at B. Knowing that the wheel rolls freely along a cylindrical surface of radius R ($R>L$), and neglecting friction, derive an expression in θ, L and R which must be satisfied when the rod is in equilibrium. Also find the reactions at A and B when $L = 150$ mm, $R = 200$ mm and $W = 100$ N. (25%)



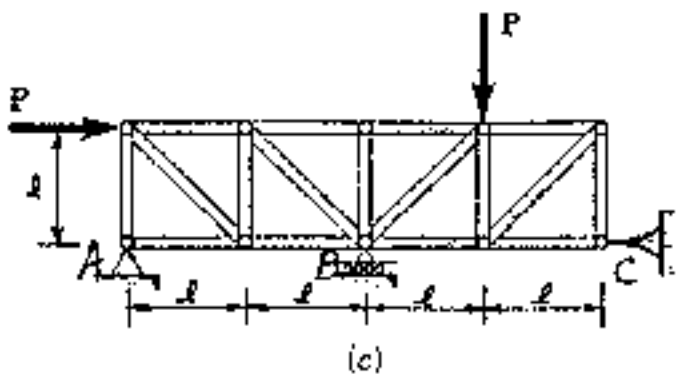
Classify each of the trusses shown as completely, partially, or improperly constrained; if completely constrained, further classify as determinate of indeterminate. Also calculate the reactions for the statically determinate structure(s). (25%)



(a)

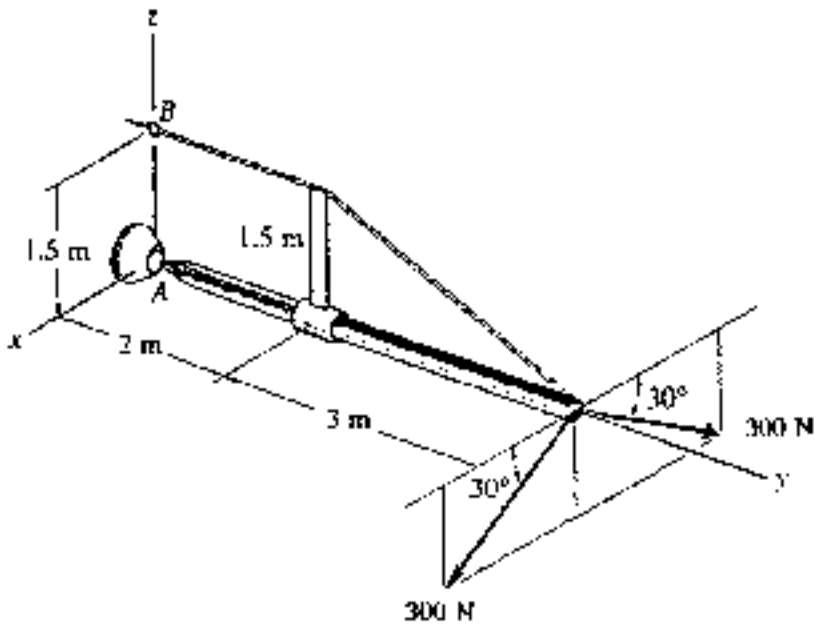


(b)



(c)

3. The boom is supported by a ball-and-socket joint at A and a guy wire at B as shown in the figure. If the loads are each 300 N and they are in a plane parallel to the x-y plane, determine the components of reaction at A for equilibrium. (25%)



4. The pivot bearing is subject to a conical pressure distribution at its surface of contact as shown in the figure. The bearing radius is 0.1 m and the shaft supports an axial force of 100 N. Determine the torque M required to overcome friction and turn the shaft, if the coefficient of static friction is 0.2. (25%)