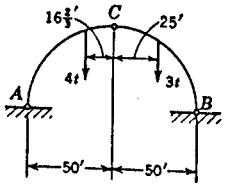
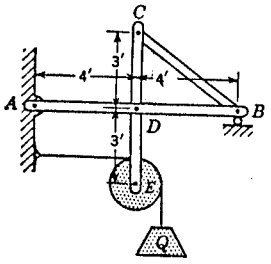
Engineering Mechanics -- Statics

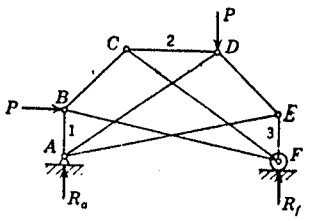
(1) (a) (10%) Find the reactions at the supports A and B of the semicircular three-hinged arch loaded as shown below.



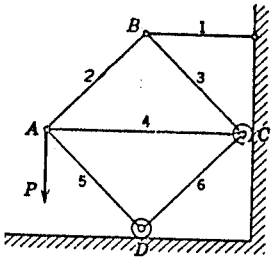
(b) (15%) The frame structure as shown below supports a load $Q = 1000$ lb. Assuming ideal pins at all joints, find the compressive force S in the bar BC and the shear force R_d on the pin at D. The pulley at E has a radius $r = 1$ ft.



(2) (a) (15%) Determine the forces in bars 1, 2, and 3 of the plane truss loaded and supported as shown below if $ABCDEF$ is one-half of a regular octagon.



(b) (10%) Determine the axial force in each bar of the plane truss supported and loaded as shown below. $ABCD$ is a square; AC is horizontal.



(背面仍有題目,請繼續作答)

Engineering Mechanics – Dynamics

(3) (a) (10%) A wheel of radius r rolls on a flat surface without slipping, as shown in Fig. 3(a). Determine the angular motion of the wheel in terms of the linear motion of its center O. Also determine the acceleration of a point on the rim of the wheel as the point comes into contact with the surface upon which the wheel rolls.

(b) (10%) The wheel of radius r rolls to the left without slipping and, at the instant considered, the center O has a velocity v_O and an acceleration a_O to the left. Determine the acceleration of points A and C on the wheel for the instant considered.

(c) (10%) The crank OA revolves clockwise with a constant angular velocity of 10 rad/s within a limited arc of its motion. For the position $\theta = 30^\circ$ determine the angular velocity of the slotted link CB and the acceleration of A as measured relative to the slot in CB.

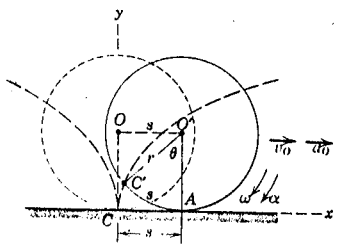


Fig. 3(a)

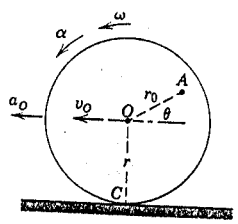


Fig. 3(b)

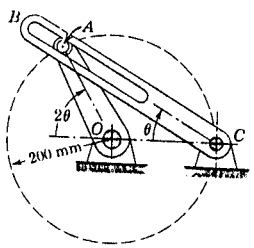


Fig. 3(c)

(4) (20%) Determine the minimum velocity v which the wheel may have and just roll over the obstruction. The centroidal radius of gyration of the wheel is k, and it is assumed that the wheel does not slip.

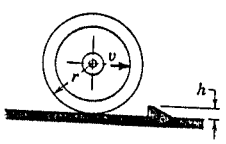


Fig. 4