

1. (20%)

The pin-jointed framework shown in Fig. 1 is stable. Find the force in member AB in terms of force P .

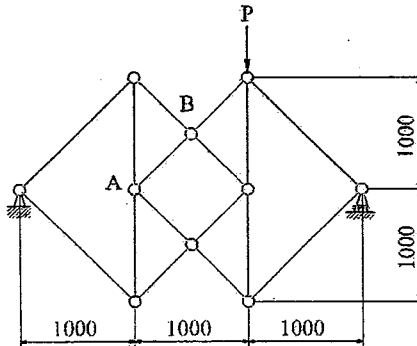


Fig. 1 (unit: mm)

2. (20%)

Three identical homogeneous cylinders are placed on a horizontal table, so that each is in contact with the other two. If the coefficient of friction is the same at all contact surfaces, find the smallest value of the frictional coefficient for which the cylinders can remain in equilibrium in the configuration shown in Fig. 2.

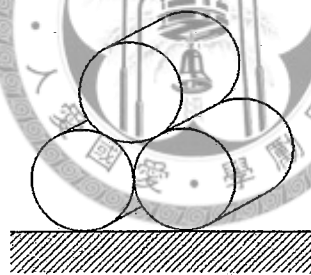


Fig. 2

3. (20%)

Two links of length b are hinged as shown in Fig. 3. The end of one link is sliding along a horizontal bar. The sliding end is restrained by a spring which is unstressed when $\theta = 0$. What moment M is required to rotate the link against the weight W and the spring with spring constant k ?

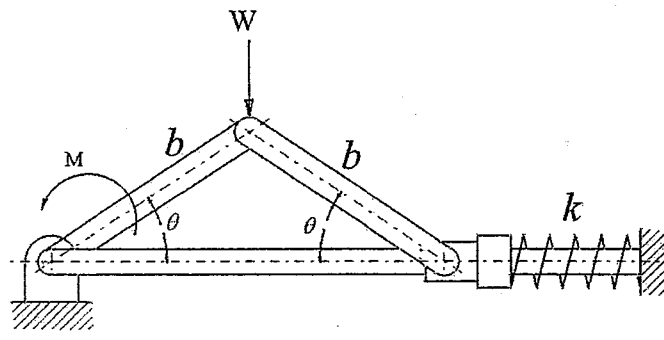


Fig. 3

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4. (20%)

A flat belt drive system is designed as shown in Fig. 4. The driver pulley speed is 1800 rpm, the driven pulley speed is 900 rpm. The diameter of driver pulley is 100mm. The center distance between driver and driven pulley is 400mm. The static coefficient of friction between belt and pulley is 0.3.

- (a) Find the tension in the tight side and slack side of the belt while the rated power 2.0 kW is transmitted.
- (b) Draw the tension distribution of the belt along the whole belt system if the belt tension induced by bending about pulley is ignored.

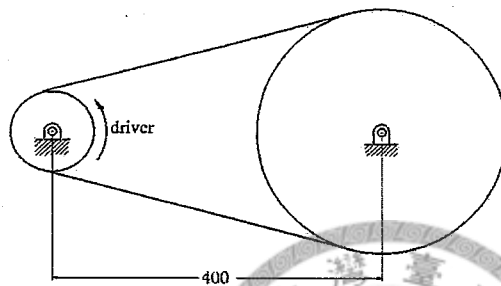


Fig. 4 (length unit: mm)

5. (20%)

A shaft and a helical gear assembly designed for a speed reduction unit is shown in Fig.5. The forces exerted on the gear teeth are resolved into three rectangular components as shown. Assuming that axial thrust force is all taken by bearing A, find the resultant forces acting on the bearing A and B.

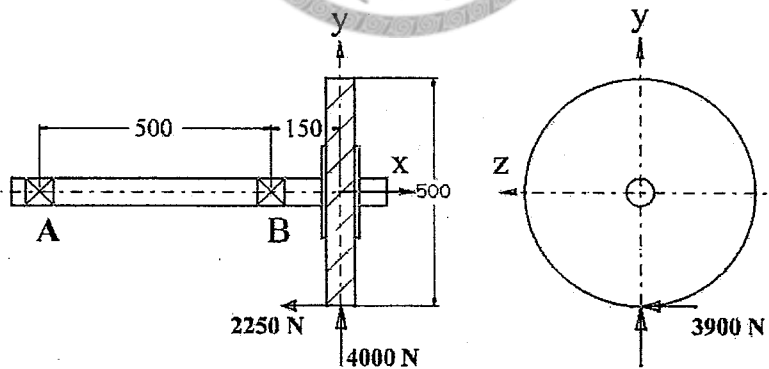


Fig. 5 (length unit: mm)

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