1. Arm AB rotates clockwise in the horizontal plane and moves the pin C along the fixed circular groove (see Fig.1). The constant rotating speed of arm AB is 120 rpm. Mass of pin C: 1 kg. Radius of circular curve: 1.0 m. When $\phi = 90°$, determine
   (a) Velocity of pin C. (5%)
   (b) Acceleration of pin C.(5%)
   (c) Force exerted on pin C by arm AB.(5%)

2. In Fig.2, the spring is initially elongated 200 mm. $m_A = 2$ Kg, $m_B = 1$ Kg. The spring constant of the spring is k = 1000 N/m. Friction between block A and the horizontal plane is 0.1. Determine the velocity of block A at position where the spring has no force. (15%)

3. In Fig. 2, the mass of bar AB is 2 kg and the mass of the sliders is negligible. The length of bar AB is L = 3 m. The system lies in the vertical plane. If the bar was at rest when $\theta = 0°$, determine the follows:
   (a) Velocity of slider A when $\theta = 30°$. (5%)
   (b) Angular velocity (ω) of bar AB when $\theta = 30°$. (5%)
   (c) Velocity (v_G) at center point G of bar AB when $\theta = 30°$. (5%)
   (d) Kinetic energy of bar AB when $\theta = 30°$. ($I_G = mL^2/12$). (5%)

4. In Fig. 4, E (modulus of elasticity) and A (cross section area) are constant for each bar. Determine
   (a) Forces in the bars AD and BD. (6%)
   (b) Deformation of the bars AD and BD. (6%)

5. A solid bar ABCD has diameter d = 3 in is shown in Fig. 5. The A-end of solid bar is fixed. The D-end of solid bar is supported by a bearing. $T_B = 20000$ in-lb, $T_C = 10000$ in-lb. $T_D = 0$ in-lb. $G = 1.1\times10^7$ lb/in^2. Determine
   (a)Maximum shear stress of bar ABCD. (6%)
   (b)Torsion angle at the point D (related to end A). (7%)

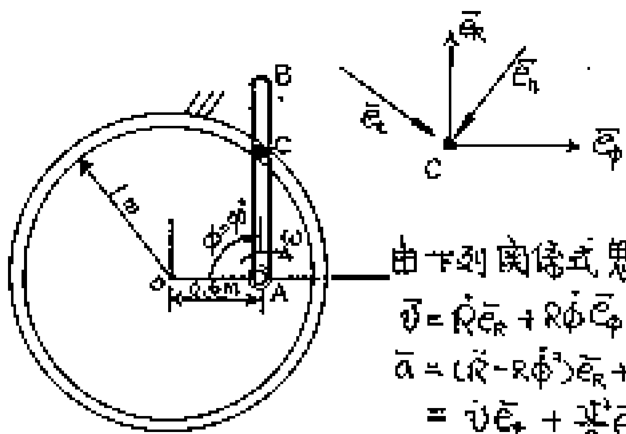
6. Drawing the bending moment diagram and shear force diagram of the beam shown in Fig. 6. (10%)

7. A supported cantilever beam AB with length L = 2m is shown in

Fig. 7. The uniform load on the beam is Q = 500 kg/m. Determine

(a) Reaction R_A and R_B. (8%)

(b) Moment M_A. (7%)



由下列關係式思考：

$\bar{v} = \dot{R}\bar{e}_R + R\dot{\phi}\bar{e}_\phi = v\bar{e}_t$

$\bar{a} = (\ddot{R} - R\dot{\phi}^2)\bar{e}_R + (R\ddot{\phi} + 2\dot{R}\dot{\phi})\bar{e}_\phi$

$= \dot{v}\bar{e}_t + \frac{v^2}{\rho}\bar{e}_n \cdots\cdots$

Fig. 1

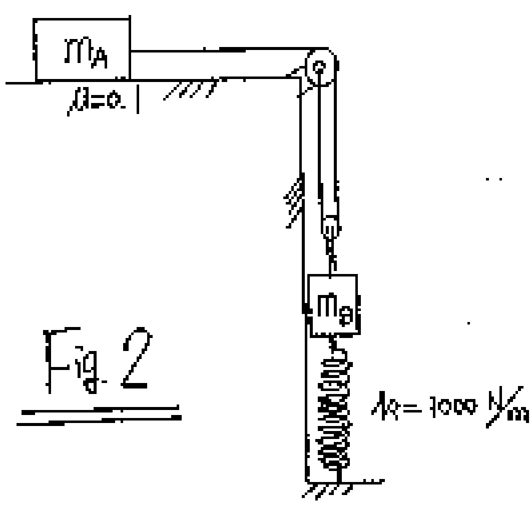


Fig 2

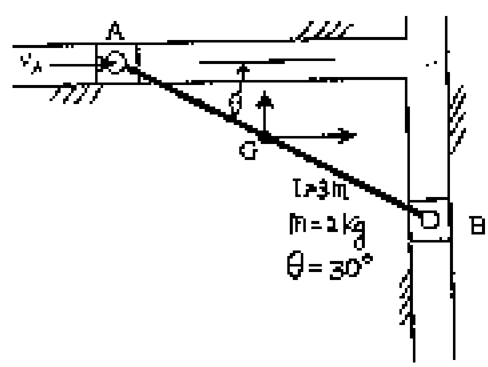


Fig. 3

Fig.4

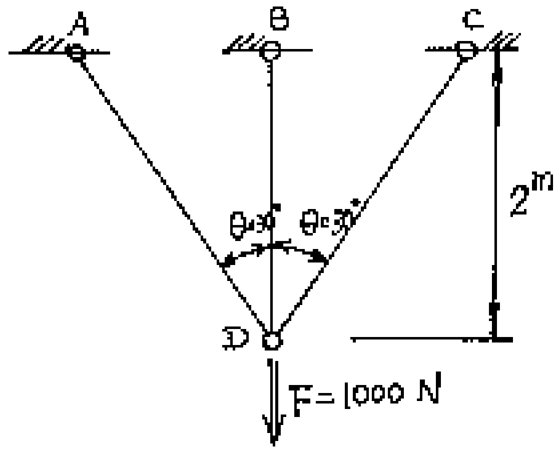


Fig.5

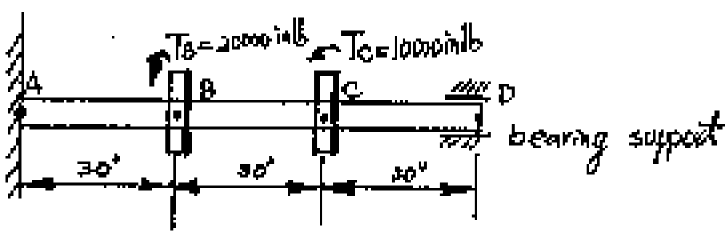


Fig.6

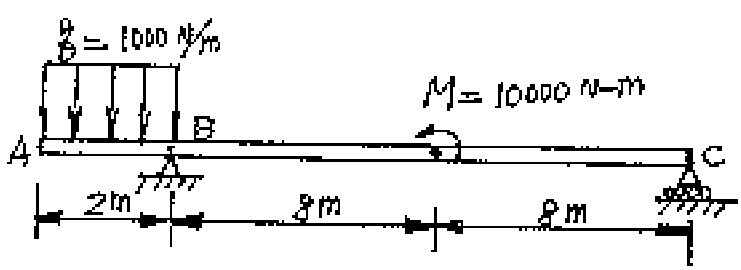


Fig.7