1. The 30-kg eletric motor shown in Fig. 1 is supported by four springs, each spring having a stiffness of 200 N/m. If the rotor R is unbalanced such that its effect is equivalent to a 4-kg mass located 60 mm from the axis of rotation, determine (a) the speed in rpm at which resonance will occur. (b)the amplitude of vibration when the rotor is turning at $\omega$ = 10 rad/s.(20%)

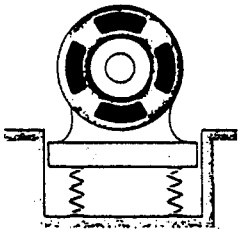


Fig. 1

2. The 20-kg roll of paper has a radius of gyration $k_A$=90 mm about an axis passing through point A. It is pin-supported at both ends by two brackets AB. If the roll rests against a wall for which the coefficient of kinetic friction is $\mu_c$=0.2, and a vertical force of 30 N is applied to the end of the paper, determine the angular acceleration of the roll as the paper unrolls.(20%)

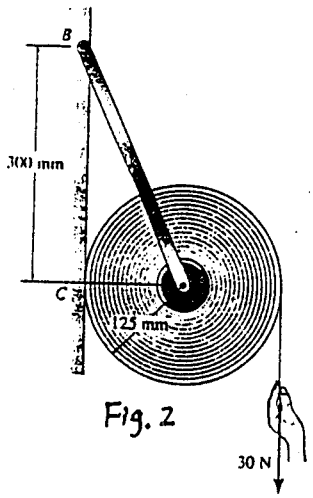



Fig. 2

3. A uniform slender rod AB of length L and weight W is supported as shown. If cable AD suddenly breaks, determine (a) the angular acceleration of the rod, (b) the tension in wires AC and BC.(20%)

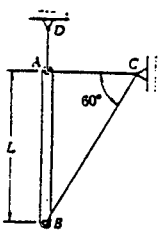
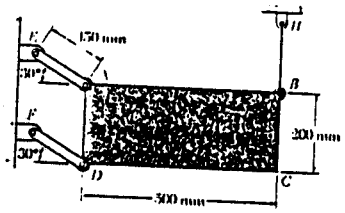



Fig. 3

4. The thin plate ABCD has a mass of 8 kg and is held in the position by the wire BH and two links AE and DF. Neglecting the mass of the links, determine immediately after wire BH has been cut (a) the acceleration of the plate, (b) the force in each link.(20%)

Fig. 4




5.(a) In this position shown, the rod BD moves downward through the fixed collar at C with $V_{BD}$ as indicated, and its pin at B slides in the slot of the member AE. Determine for this position $\omega_{AE}$ of AE and $V_{B/AE}$ of the pin at B relative to AE.

(b) In the position shown, the rod BD moves with $a_{BD}$=25 mm/s² ↑ as well as $V_{BD}$ as indicated. For this position, determine $\alpha_{AE}$ of the member AE and $a_{B/AE}$ of the pin at B relative to AE. (20%)

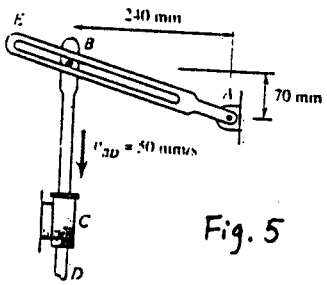



Fig. 5