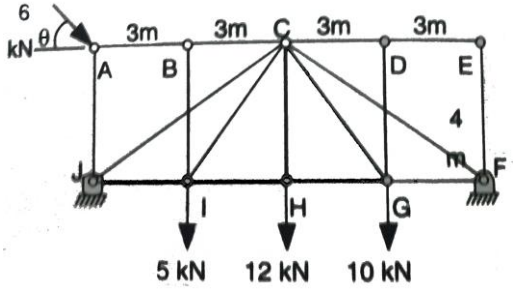
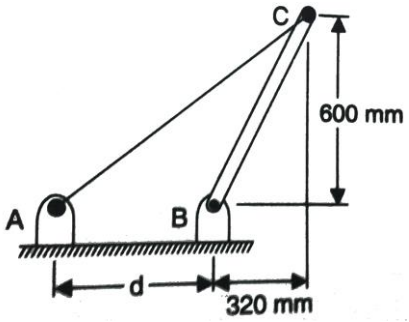
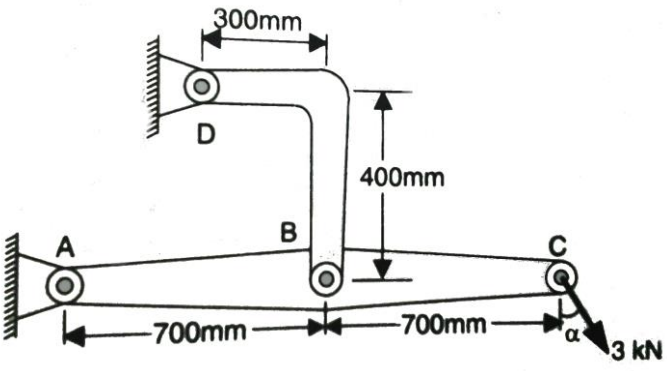
1) Given figure shows a truss in which the members CJ and CF of the loaded truss cross but are not connected to members BI and DG. Determine the values of α for which the truss cannot be in equilibrium. Write a MATLAB programme to plot the forces in members BC, JC, IC, and IG as a function of α.



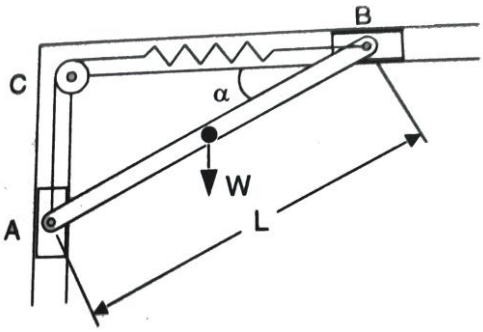
2) In the given figure rod CB is held by a cord AC which has a tension T. Write a MATLAB programme to determine,
   a) The moment about B of the force exerted by the cord at point C as a function of the tension T and the distance d.
   b) Plot the moment about B for 300mm ≤ d ≤ 1000mm when (i) T= 60N, (ii) T = 80N, (iii) T = 110N.



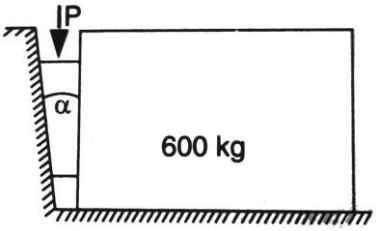
3) Given figure shows a frame in which the structural member supports the 5kN load. The load may be applied at any angle α(-90° to +90°), The pins at A and B need to be designed to support the maximum force transmitted to them, Write a MATLAB programme to plot the forces at A and B as a function of α and find their maximum values and corresponding angles α.



4) Given figure shows a slender rod AB of weight W attached to blocks at A and B which moves freely in the guides.
   a) Derive a relationship between α, W, L and k that need to be satisfied for the rod to be in equilibrium. The spring constant is k, W=20 lb and L= 50 inch.
   b) Write a MATLAB programme to compute and plot k as a function of α for $15^o \leq \alpha \leq 40^o$.
   c) Determine the two values of α corresponding to equilibrium when k = 0.8 lb/in.



5) In the given figure the horizontal position of the rectangular block is adjusted by the wedge under the action of the force P. The wedge angle is α. μ_1 and μ_2 are the coefficient of static friction at the two wedge surfaces and between the block and the horizontal surfaces respectively.
   a) Obtain a general expression for P (the least force required to move the block) in terms of α, μ_1 and μ_2.
   b) Write a MATLAB programme to plot P as a function of μ_1 for α=15,20 and 25^o. $\mu_2 = 0.5$.
   c) For $\alpha = 10^o$, plot P as a function of μ_1 for μ_2 = 0.2, 0.4, 0.6 and 0.8.



6) Given figure shows a large turnbuckle which supports a cable tension of 12,000 lb. The mean diameter of the two 1.25 inch screws is 1.15 inch and has five square threads per inch. Both screws have single threads.
   a) Determine the moments M_T and M_L that must be applied to the body of the turnbuckle in order to tighten and loosen it respectively.
   b) Write a MATLAB programme to plot the moments M_T and M_L as functions of μ for $0 \leq \mu \leq 1$, where μ is the coefficient of friction for the threads.