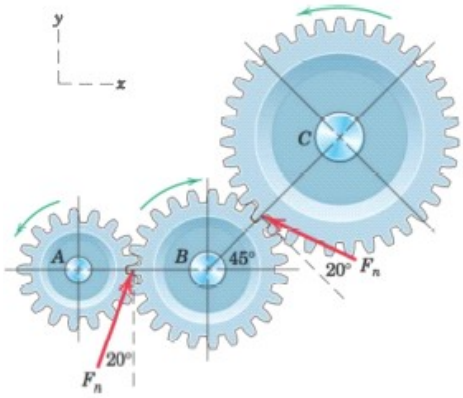
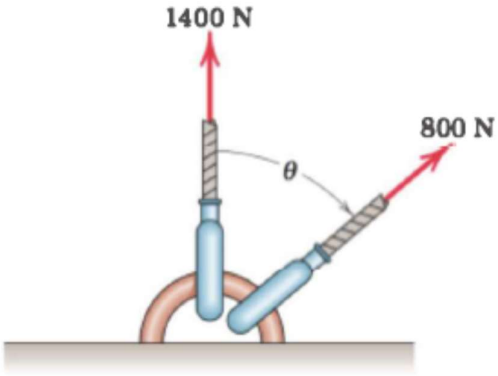
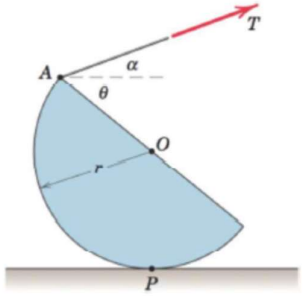
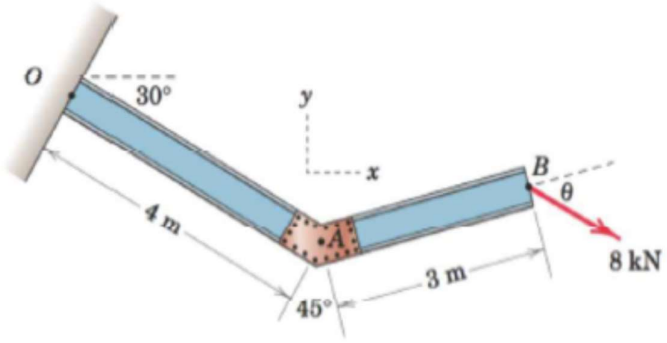
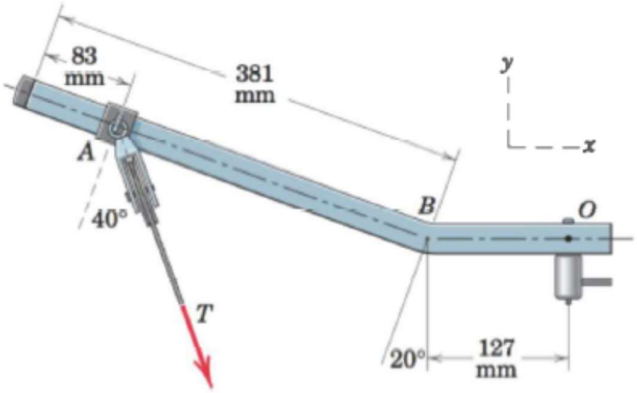
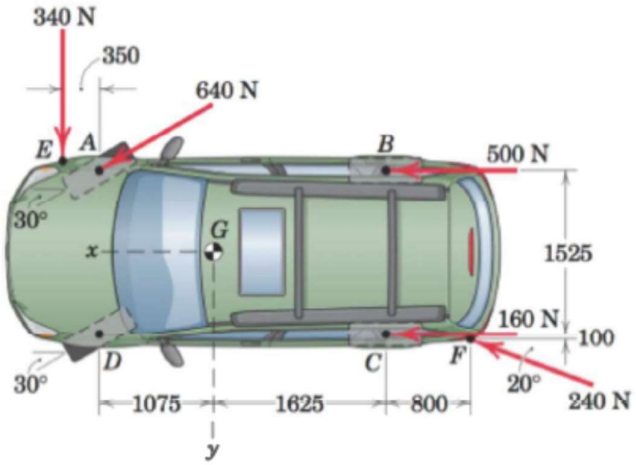
PES university (EC Campus)

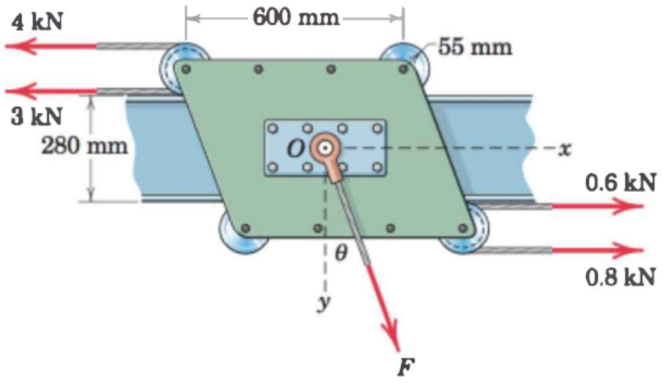
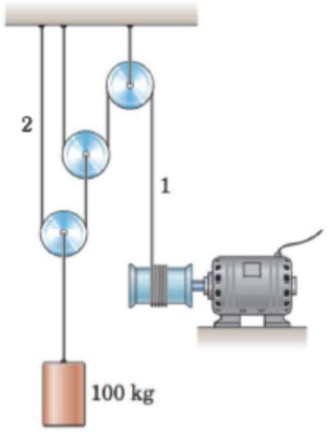
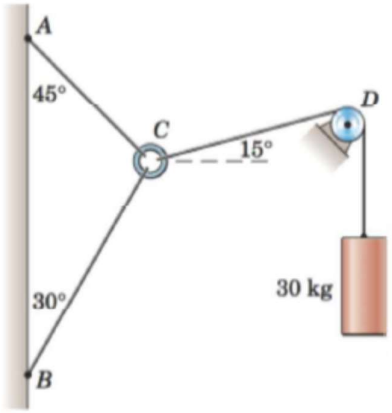
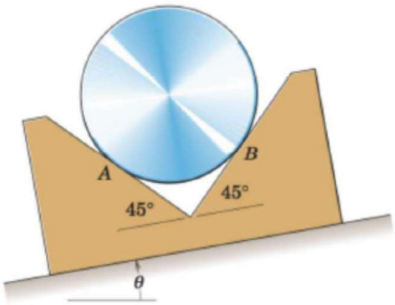
Engineering Mechanics Statics: UE24CV141A

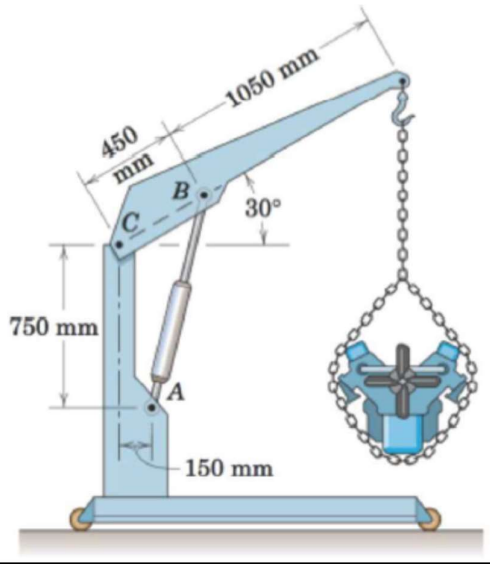
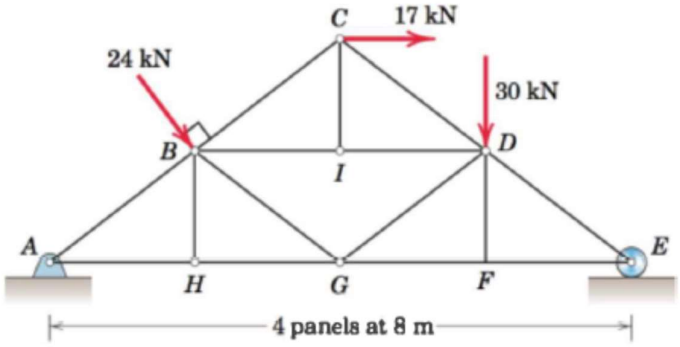
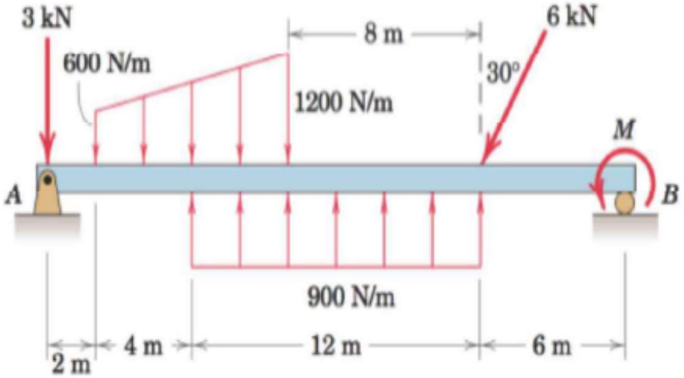
Assignment (Section A, B, C, D, E, F, G & H)

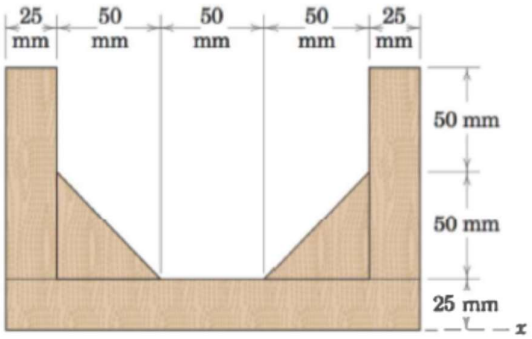
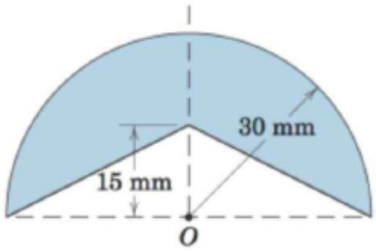
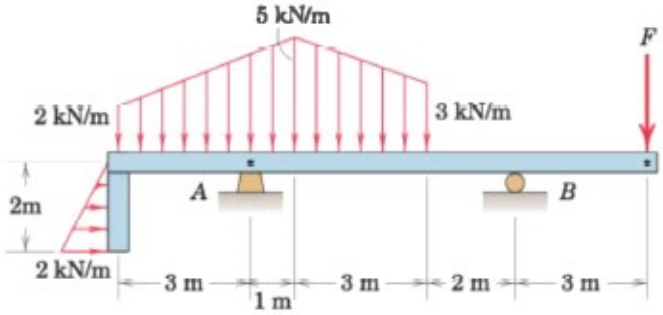
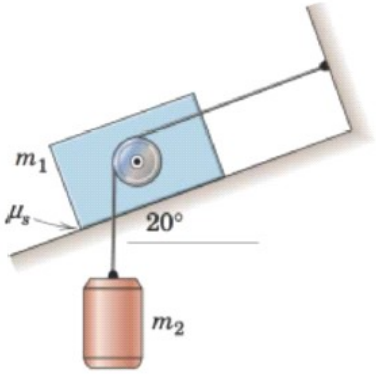
1st semester, Session Sep 2024 – Jan 2025

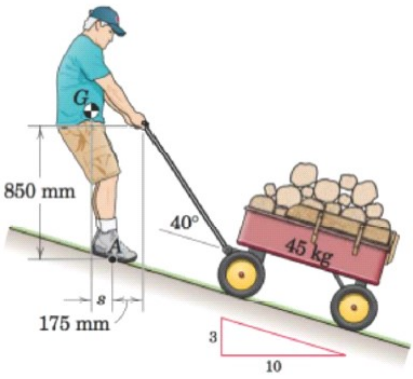
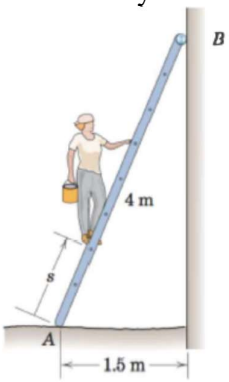
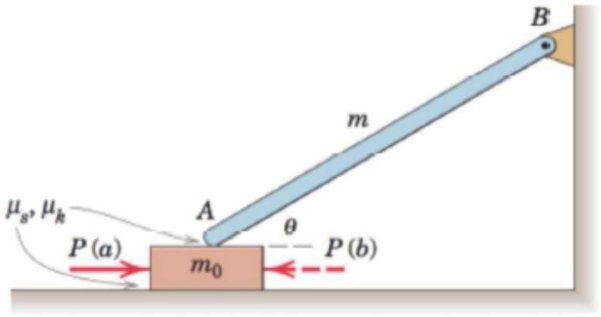
1	Power is to be transferred from this pinion A to the output gear C inside a mechanical drive. Because of output motion requirements and space limitations, an idler gear B is introduced as shown. A force analysis has determined that the total contact force between each pair of meshing teeth has a magnitude F_n = 5500 N, and these forces are shown acting on idler gear B. Determine the magnitude of the resultant R of the two contact forces acting on the idler gear. Complete both a graphical and a vector solution. 
2	At what angle θ must the 800 N force be applied in order that the resultant R of the two forces have a magnitude of 2000N? For this condition, determine the angle β between R and the vertical. 
3	Determine the moments of the tension T about point P and about point O. 
4	The bent cantilever beam is acted upon by an 8 kN force at B. if the angle θ = 35^0, determine (a) the moment M_0 of the forces about point O and (b) the moment M_A of the force about A. What value(s) of θ ($0 < 360^0$) will results in the maximum possible man uses a crowbar to lift the corner of a hot tub for maintenance purposes. Determine the moment made by moment about point O, and what is the magnitude of the moment at those orientations?

	
5	An overhead view of a portion of an exercise machine is shown. If the tension in the cable is T = 780 N, determine the equivalent force couple system at (a) point B and at (b) point O. Record your answers in vector form. 
6	Uneven terrain conditions cause the left front wheel of the all-wheel drive vehicle to lose traction with the ground. If the driver cases the traction forces shown to be generated by the other three wheels while his two friends exert the indicated forces on the vehicle periphery at points E and F, determine the resultant of this system and the x- and y-intercepts of its line of action. Note that the front and rear tracks of the vehicle are equivalent: that is AD = BC. Treat this as a two-dimensional problem and realize that G lies on the car centreline. 
7	Five forces are applied to the beam trolley as shown. Determine the coordinates of the point on the y-axis through which the stand-alone resultant R must pass if F = 5 kN and θ = 30^0.

	
8	The winch takes in cable at the constant rate of 200mm/s. If the cylinder mass is 100 kg, determine the tension in cable 1. Neglect all frictions. 
9	Three cables are joined at the junction ring C. Determine the tension in cables AC and BC caused by the weight of the 30 kg cylinder. 
10	Find the angle of tilt θ with the horizontal so that the contact force at B will be one-half that at A for the smooth cylinder. 

11	The portable floor crane in the automotive shop is lifting a 100 kg engine. For the position shown compute the magnitude of the force supported by the pin at C and the oil pressure p against the 80 mm diameter piston of the hydraulic cylinder unit AB. 
12	Determine the force in each member of the loaded truss. All triangles are 3-4-5. 
13	Determine the magnitude of the moment M which will cause beam to just begin to lift off the roller at B. For this value of M, determine the magnitude of the pin reaction at A. 
14	Determine the moment of inertia of the cross-section area of the reinforced channel about the x-axis.

	
15	Calculate the polar moment of inertia of the shaded area about point O. 
16	For the beam and loading shown, determine the magnitude of the force F for which the vertical reaction at A and B are equal. With this value of F, compute the magnitude of the pin reaction at A. 
17	Determine the range of mass m_2 for which the systems is in equilibrium. The coefficient of static friction between the block and the incline is μs = 0.25. Neglect friction associated with the pulley. 
18	An 82 kg man pulls the 45 kg cart up the incline at steady speed. Determine the minimum coefficient μs of static friction for which the man's shoes will not slip. Also determine the distance required for equilibrium of the man's body.

	
19	Determine the distance s to which the 9 kg painter can climb without causing the 4 m ladder to slip at its lower end A. The top of the 15 kg ladder has a small roller, and at the ground the coefficient of static friction is 0.25. The mass center of the painter is directly above her feet. 
20	Determine the magnitude P of the horizontal force required to initiate motion of the block of mass m0 for the cases (a) P is applied to the right and (b) P is applied to the left. Complete a general solution in each case, and then evaluate your expression for the values $\theta = 30^0$, $m = m_0 = 3$ kg, $\mu_s = 0.6$ and $\mu_s = 0.5$. 

Note:

- Solve the above problems in Bluebook.
- Draw the diagram, Freebody diagram, Substitution and calculation in details.
- Submit the book personally in the classroom/staffroom and signed the submission documents for the reference.