VIT

Vellore Institute of Technology

SCHOOL OF MECHANICAL ENGINEERING

Continuous Assessment Test - I, Fall 2018-19

B. Tech. (Mechanical), August 2018

Class Nbr. : VL2018191000655/ 786/ 802/ 808/ 856/ 758/ 827/ 837/ 842/ 815

Slot: A1+TA1+V1

Course Code : MEE1002 **Duration** : 90 Minutes.

Course Name : Engineering Mechanics **Max. Marks** : 50

Faculty-In-Charge: Prof(s) Sakthivel/ Bharanidaran/ Edwin Sudakar/ Khalid Hussain/ Arivarasu/ Vinod Jebaraj/ Senthil Kumar/ Senthilnathan/ Velu /Ragul Singh

---

Answer all questions: **(5 x10 = 50 marks)**

1. Knowing that $\alpha = 35°$, determine the resultant of the three forces shown in figure 1. [10]

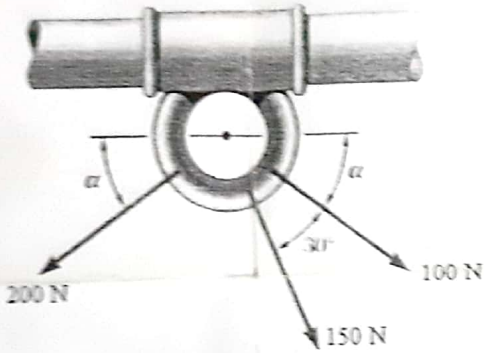


Figure 1

2. Three cables are joined at the junction ring C as shown in figure 2. Determine the tensions in cables AC and BC caused by the weight of the 30 kg cylinder. [10]

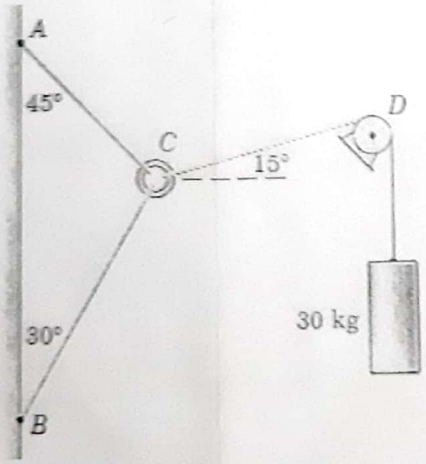


Figure 2

3. For a loaded frame AB supported as shown in figure 3, determine [10]

a) Reactions at A and B when 'a' is 150 mm.

b) Value of 'a' for which the magnitude of the reaction at B is equal to 800 N.

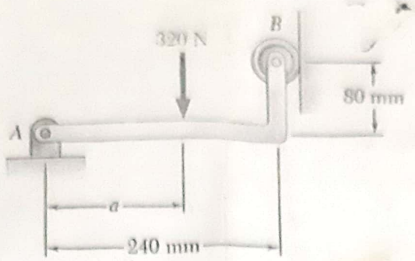


Figure 3

4. Three cables are used to tether a balloon as shown in figure 4. Determine the vertical force P exerted by the balloon at A, knowing that the tension in cable AD is 481 N. [10]

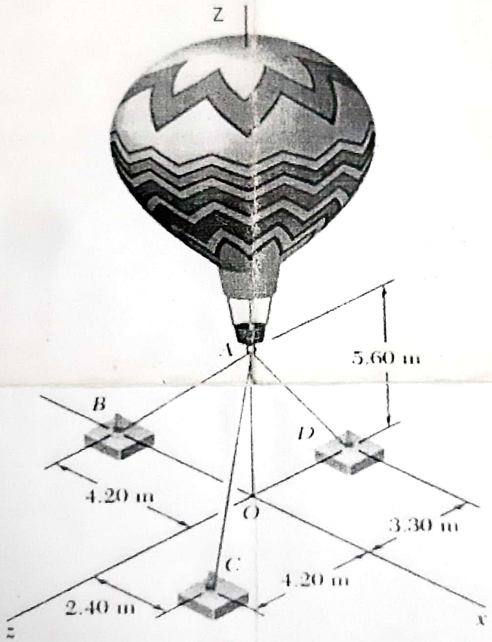


Figure 4

5. Determine the force in each member of the loaded truss, shown in figure 5. [10]

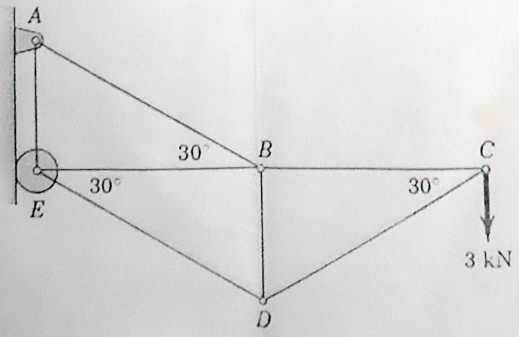


Figure 5

VIT

Vellore Institute of Technology

School of Mechanical Engineering

CAT- I, Fall Semester 2018-19

B.Tech (*Mechanical Engineering*)

Course Name	: **MEE1002/Engineering Mechanics**	**Duration**	: 90 min
Class Nbr	: 0797/0803/0818/0809/0831/0858/ 0710/0838/2984/3099	**Max. Marks**	: 50
Faculty Name	: Senthilnathan, Velu, Bharanidaran, Edwin, Khalid Hussain, Rahul singh, Senthilkumar, Sakthivel, Sovan dasgupta, Fathima patham	**Slot**	: A2

Answer all questions (5 x 10 = 50 marks)

1. A wall section is held by the ropes as shown in figure 1. If the tension is 4000N in rope AB and 6000N in rope AC, determine the magnitude and direction of the resultant of the forces exerted by the ropes AB and AC on stake A.

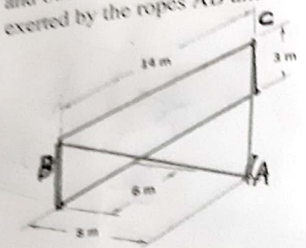


Fig. 1

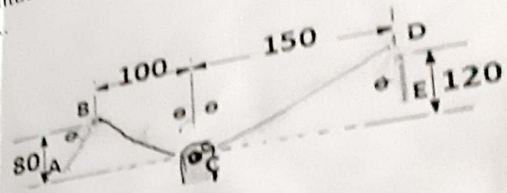


Fig. 2

2. Two links AB and DE are connected by a bell crank lever which is hinged at point C as shown in fig 2. a) Determine the tension in link DE if the tension in link AB is 1000N. b) Find the maximum force which may be safely applied by link AB on the lever so that the maximum reaction at C is 3kN.

3. The crate shown in figure 3 is supported by three cables. Determine the weight of the crate knowing that the tension in the cable AB is 3kN.

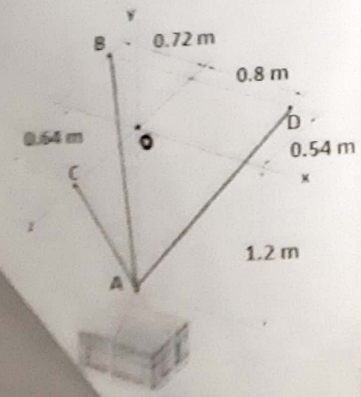


Fig. 3

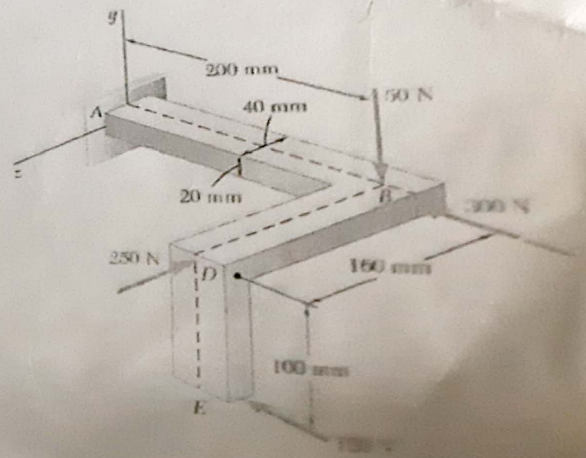


Fig. 4

4. Four forces are applied to the machine component ABDE as shown in figure 4. Replace these forces by an equivalent force-couple system at 'A'.

5. Determine the force in each member of the truss and state if the members are in tension or compression.

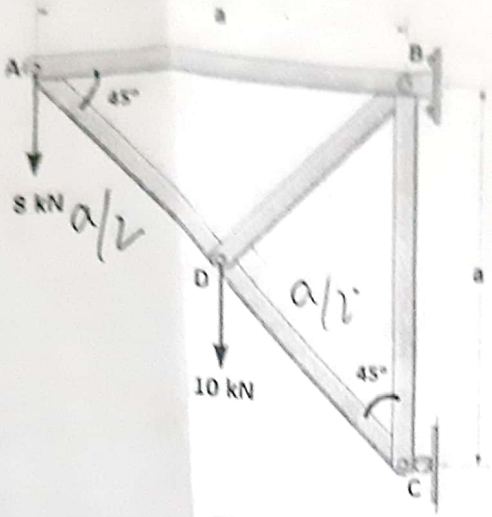


Fig. 5

****

VIT

Vellore Institute of Technology

SCHOOL OF MECHANICAL ENGINEERING

Continuous Assessment Test - I, Fall 2018-19

B. Tech. (Mechanical), August 2018

Class Nbr. : VL20181910000655/ 786/ 802/ 808/ 856/ 758/ 827/ 837/ 842/ 815

Slot: A1+TA1+V1

Course Code : MEE1002 **Duration** : 90 Minutes.

Course Name : Engineering Mechanics **Max. Marks** : 50

Faculty-In-Charge: Prof(s) Sakthivel/ Bharanidaran/ Edwin Sudakar/ Khalid Hussain/ Arivarasu/ Vinod Jebaraj/ Senthil Kumar/ Senthilnathan/ Velu /Ragul Singh

Answer all questions: **(5 x10 = 50 marks)**

1. Knowing that $\alpha = 35°$, determine the resultant of the three forces shown in figure 1. [10]

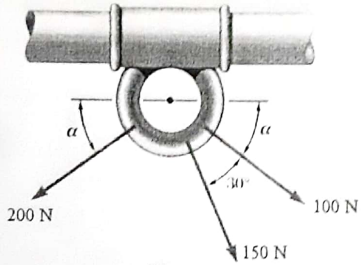


Figure 1

2. Three cables are joined at the junction ring C as shown in figure 2. Determine the tensions in cables AC and BC caused by the weight of the 30 kg cylinder. [10]

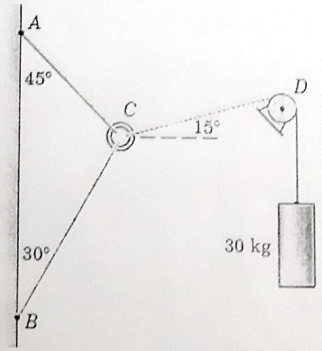


Figure 2

3. For a loaded frame AB supported as shown in figure 3, determine [10]

   a) Reactions at A and B when 'a' is 150 mm.

   b) Value of 'a' for which the magnitude of the reaction at B is equal to 800 N.

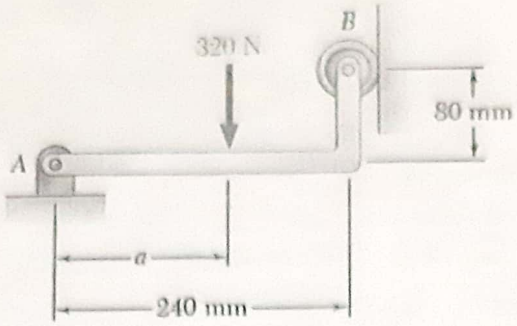


Figure 3

4. Three cables are used to tether a balloon as shown in figure 4. Determine the vertical force P exerted by the balloon at A, knowing that the tension in cable AD is 481 N. [10]

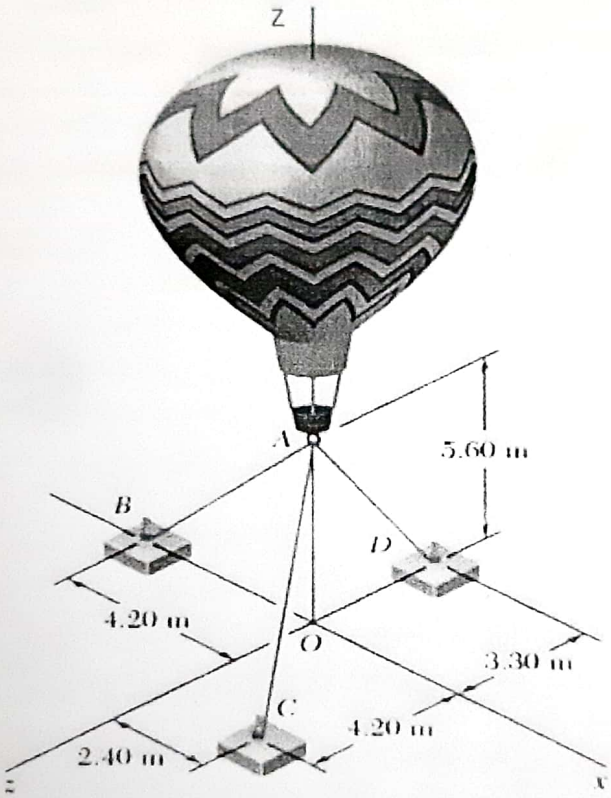


Figure 4

5. Determine the force in each member of the loaded truss, shown in figure 5. [10]

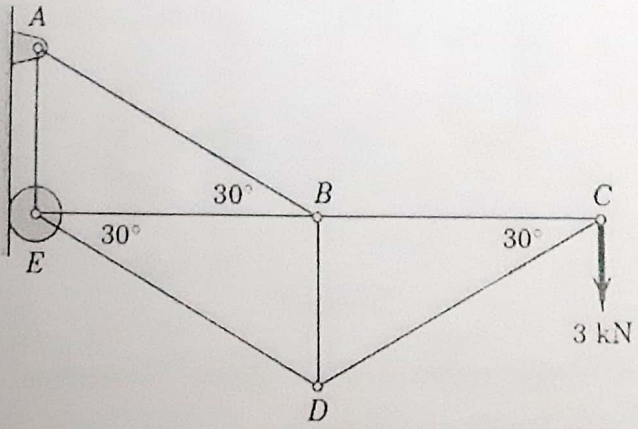


Figure 5

VIT UNIVERSITY
VELLORE • CHENNAI
www.vit.ac.in

SCHOOL OF MECHANICAL ENGINEERING

RE-Continuous Assessment Test - I, OCT 2018

B.Tech. (*Mech, Auto, Energy*), FALL Semester-2017

Course Code	: MEE1002	**Duration**	: 90 Minutes.
Course Name	: Engineering Mechanics	**Max. Marks**	: 50
Faculty-In-Charge: Rahul Singh Sikarwar		**Slot:**	A1+TA1

1. Calculate the magnitude of the moment about the base point O of 600 N in Fig. 1

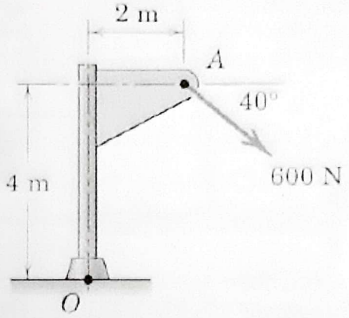
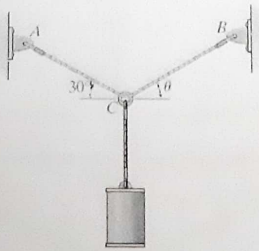
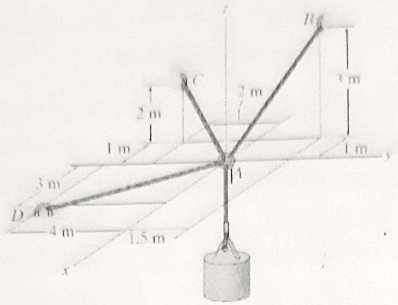


Fig.1

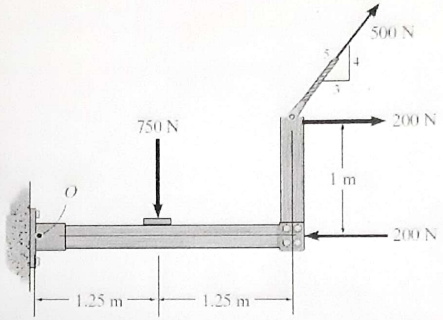
2. If cable CB is subjected to a tension that is twice that of cable CA, determine the angle θ for equilibrium of the 10-kg cylinder. Also, what are the tensions in wires CA and CB?



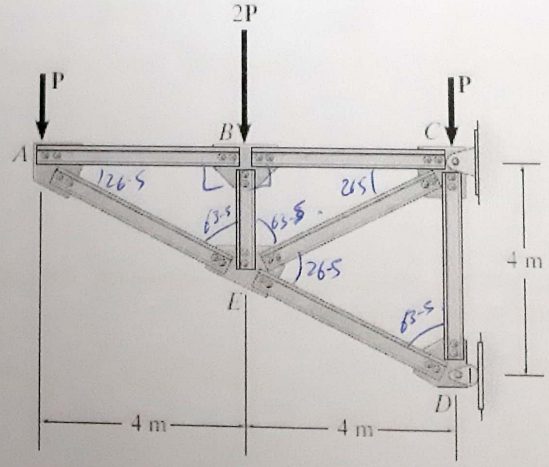
3. Determine the tension developed in cables AB, AC,and AD required for equilibrium of the 75-kg cylinder.



4. Replace the force system by a resultant force and couple moment at point *O*.



5. Determine the force in each member of the truss and state if the members are in tension or compression. Assume each joint as a pin. Set $P = 4$ kN.



VIT UNIVERSITY
VELLORE ■ CHENNAI
www.vit.ac.in

School of Mechanical Engineering

CAT- II, Winter Semester 2016-17

Course Name	:	Engineering Mechanics	**Duration**	:	90 min.
Course Code	:	MEE 1002	**Max. Marks**	:	50
			Slot	:	F1

Faculty Name : Mallikarjuna Reddy D, Bharanidaran R, Sakthivel P, Ranjith Kunnath, , Velu M, Khalid Hussain Syed, Rahul Singh Sikarwar, Vinoth Jebaraj A, Edwin Sudhagar P

Part - A (5 x 2 = 10 Marks), ***Answer all the questions***

1. The displacement of a particle moving along x-axis is given by $x = A * t^2 + B$. Where A= 2m, B= 3m. Calculate the average velocity between t = 3 sec and t = 5 sec.
2. Explain Radius of Gyration with suitable application?
3. Explain the relation between static friction and kinetic friction with sketch?
4. Discuss about the advantages of Virtual work method?
5. The uniform ladder is 2 m long and the wall at B is smooth. If the coefficient of static friction $\mu_A = 0.2$. Determine the smallest angle θ for which the ladder can remain in the position shown in **Figure 1.**

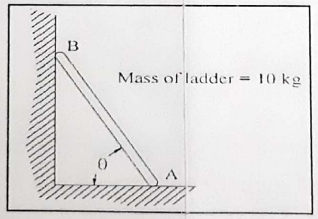


Figure 1

Part - B (4 x 10 = 40 Marks)

6. Determine the volume of the funnel shown in **Figure 2** using Theorems of Pappus and Guldinus.

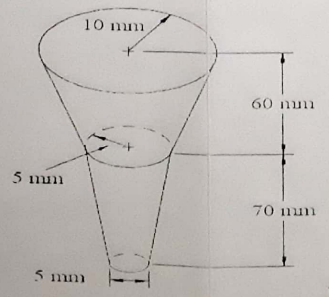


Figure 2

7. Each member of the pin-connected mechanism has mass m_l as shown in **Figure 3.** If the spring is unstreched when $\theta = 0°$. Determine the angle θ for equilibrium. where $m_l = 8\ kg$, k = 2500 N/m, L = 300 m, M = 50 Nm. (Solve by using Virtual work method)

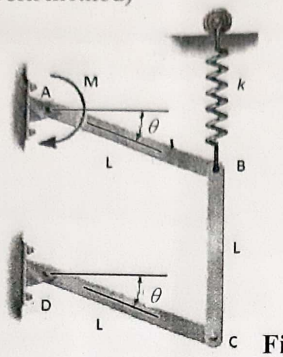


Figure 3.

8. Determine the smallest values of forces P1 and P2 required to raise block A while preventing A from moving horizontally. The coefficient of static friction for all surfaces of contact is 0.3 and the weight of wedges B and C is negligible compared to the weight of block A shown in **Figure 4.**

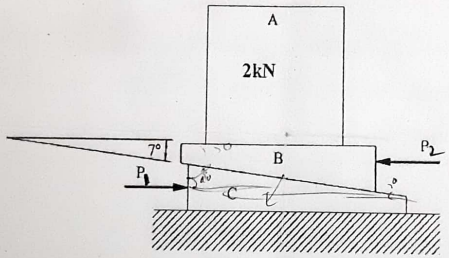


Figure 4.

9. Determine the directions of the principal axes with origin located at point O in **Figure 5** and the principal moments of inertia for the area about these axes. Where $a = 4\ m$, $b = 2\ m$, $c = 2\ m$, $d = 2\ m$, $r = 1\ m$.

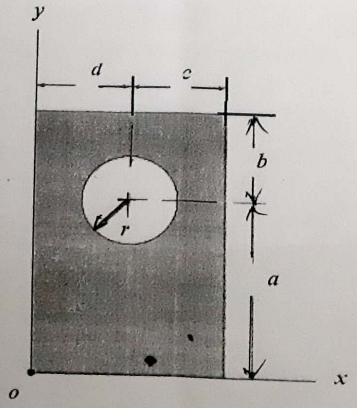


Figure 5.

VIT
Vellore Institute of Technology

Final Assessment Test – November 2018

Course: MEE1002 - Engineering Mechanics

Class NBR(s): 0655 / 0758 / 0786 / 0802 / 0808 / 0815 / 0827 / 0837 / 0842 / 0856

Slot:A1+TA1+V1

Time: Three Hours

Max. Marks: 100

General Instructions :

i) Draw neat diagram wherever required

ii) Make suitable assumption if needed

Answer any TEN Questions

(10 X 10 = 100 Marks)

1. A container is supported by three cables that are attached to a ceiling as shown in figure 1. Determine the weight W of the container, knowing that the tension in cable AB is 6 kN.

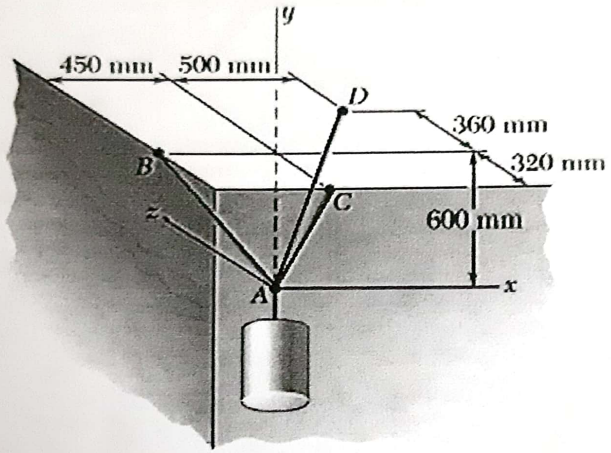


Figure 1

2. A single force P acts at C in a direction perpendicular to the handle BC of the crank shown in figure 2. Knowing that M_x = +20 Nm and M_y = - 8.75 Nm and M_z = - 30 Nm, determine the magnitude of P and the values of ϕ and θ.

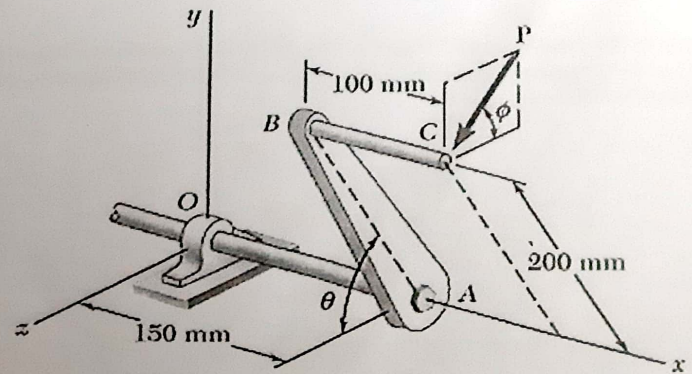


Figure 2

3. A machine component is subjected to the forces and couples shown in figure 3. The component is to be held in place by a single rivet that can resist a force but not a couple. For P =0, determine the location of the rivet hole if it is to be located (i) on line FG, (ii) on line GH.

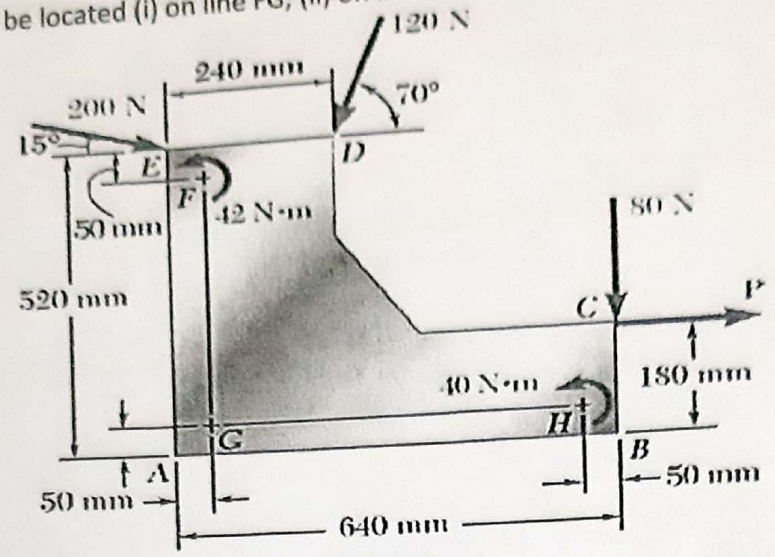


Figure 3

4. The truss shown in figure 4 is one of several supporting an advertising panel. Determine the internal forces of the members meeting at the joint 'E' of the truss for a wind load equivalent to the two forces of 800 N each shown at the joints D and E. State whether these members are in tension or compression.

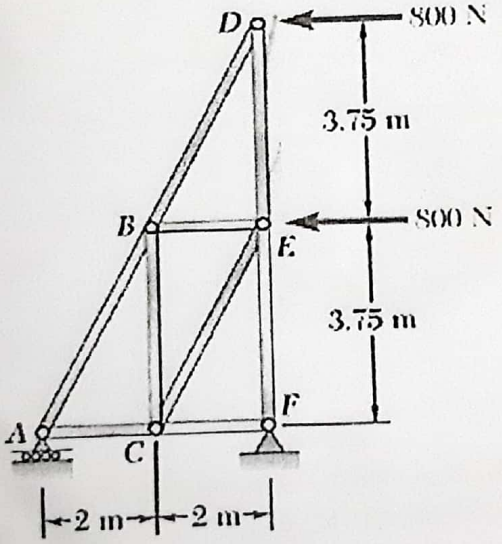


Figure 4

5. A 40 kg packing crate is pulled by a rope as shown in figure 5. The coefficient of static friction between the crate and the floor is 0.35. If α = 40 degrees, determine (i) the magnitude of the force P required to move the crate, (ii) whether the crate will slide or tip.

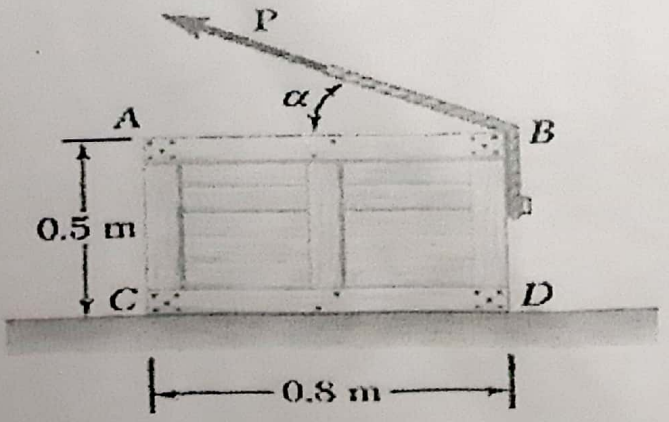


Figure 5

ature of the cadet

e frame for a sign is fabricated from thin, flat steel bar stock of mass per unit length 4.73 kg/m. The frame is supported by a pin at C and by a cable AB as shown in figure 6. Determine (i) the tension in the cable, (ii) the reaction at C.

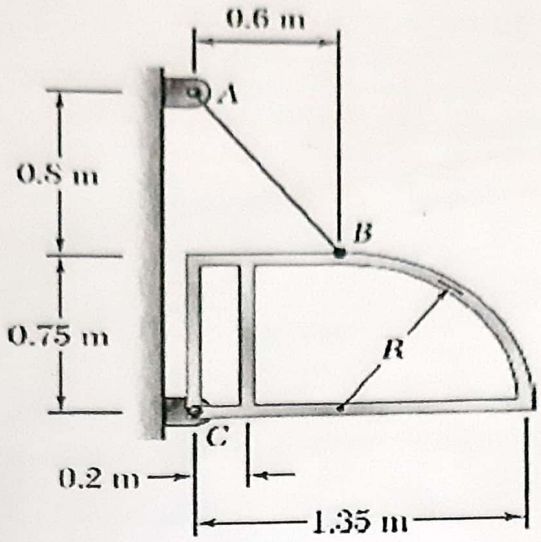


Figure 6

7. For the area indicated in figure 7, determine the orientation of the principal axes at the origin 'C' and the corresponding values of the moments of inertia.

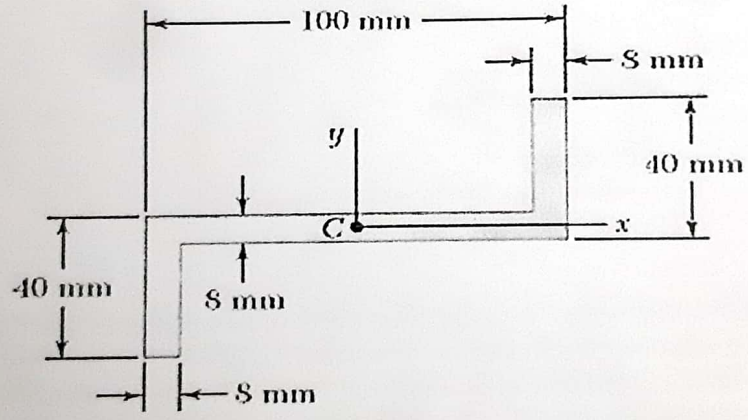


Figure 7

8. Derive an expression for the magnitude of the couple M required to maintain the equilibrium of the linkage shown in figure 8 applying method of virtual work.

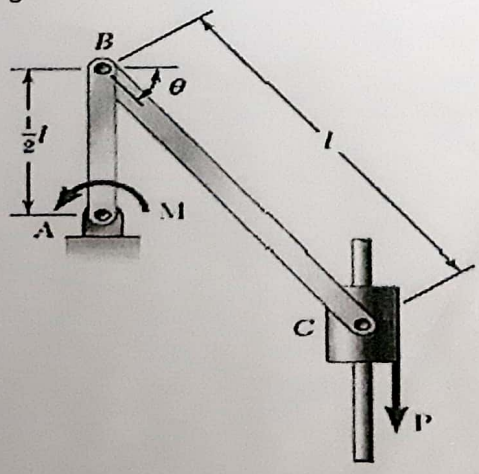


Figure 8

9. A helicopter is flying with a constant horizontal velocity of 180 km/h and is directly above point A when a loose part begins to fall. The part lands 6.5 sec later at point B on an inclined surface. Determine (i) the distance 'd' between points A and B, (ii) the initial height 'h'.

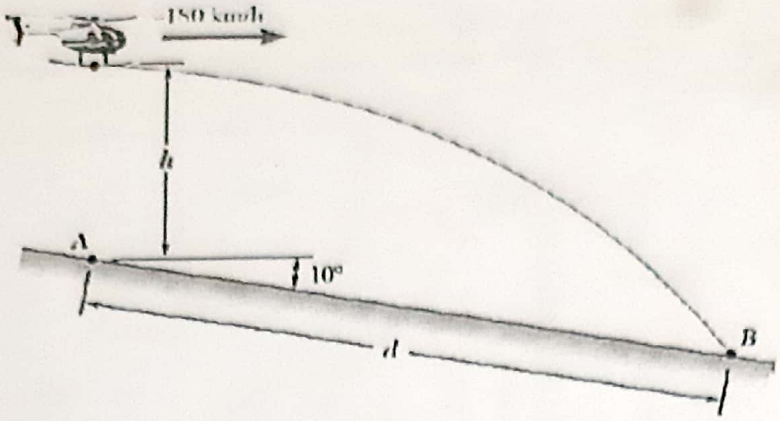


Figure 9

10. Knowing that at the instant shown in figure 10 the angular velocity of rod AB is 15 rad/s clockwise, determine (i) the angular velocity of rod BD, (ii) the velocity of the midpoint of rod BD.

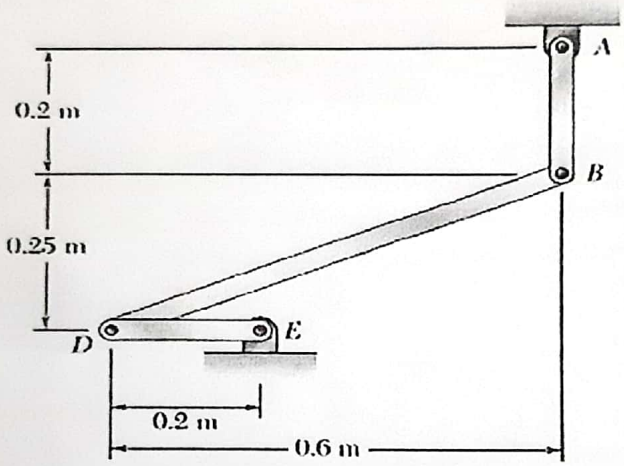


Figure 10

11. To transport a series of bundles of shingles A to a roof, a contractor uses a motor-driven lift consisting of a horizontal platform BC which rides on rails attached to the sides of a ladder. The lift starts from rest and initially moves with a constant acceleration a_1 as shown in figure 11. The lift then decelerates at a constant rate a_2 and comes to rest at D, near the top of the ladder. Knowing that the coefficient of static friction between a bundle of shingles and the horizontal platform is 0.3, determine the largest allowable acceleration a_1 and the largest allowable deceleration a_2 if the bundle is not to slide on the platform.

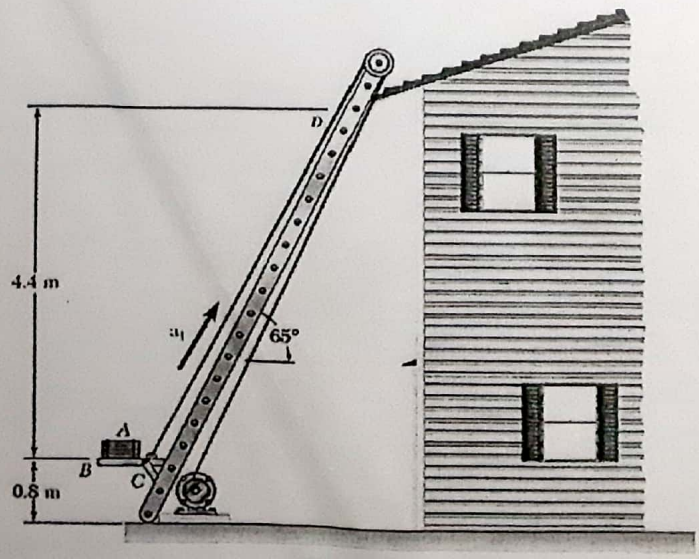


Figure 11

12. The double pulley shown in figure 12 has a mass of 15 kg and a centroidal radius of gyration of 160 mm. Cylinder A of 5 kg and block B of 15 kg are attached to cords that are wrapped on the pulleys as shown. The coefficient of kinetic friction between block B and the surface is 0.2. Knowing that the system is at rest in the position shown when a constant force P = 200 N is applied to cylinder A, determine the velocity of cylinder A as it strikes the ground.

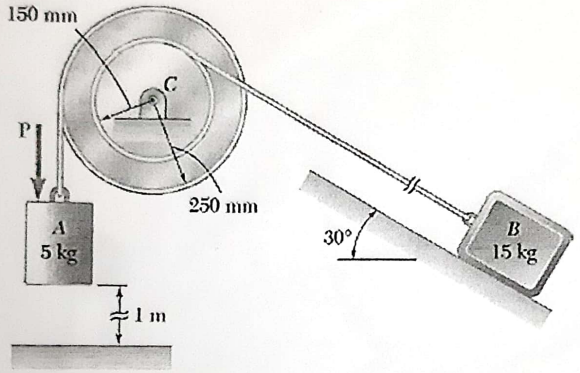


Figure 12

⇔⇔⇔