Course Code: ESC106A
Course Title: Construction Materials and Engineering Mechanics

Lecture No. 24:
Problems on Equilibrium of Coplanar Concurrent Force systems - Connected Bodies

Delivered By: Deepthi M V

Lecture Intended Learning Outcomes

At the end of this lecture, students will be able to:

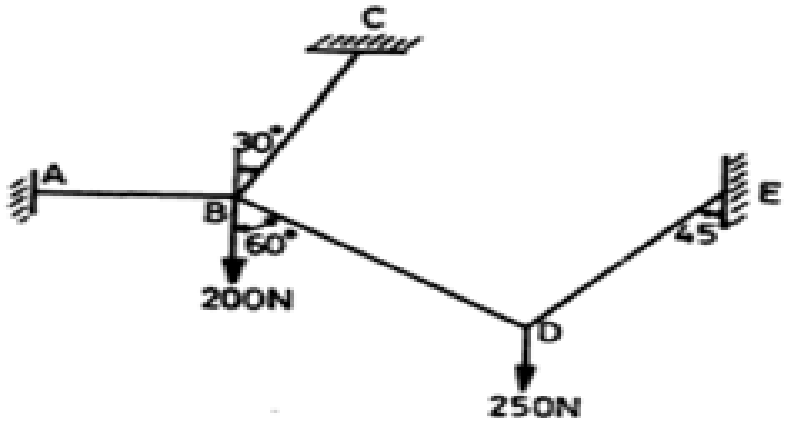
- Apply the Lami's theorem to solve equilibrium related problems (for 3 force system)
- Apply the conditions of equilibrium to solve problems(for more than 3 force system)
- Calculate the unknown forces or reactions for equilibrium of coplanar concurrent force system involving connected bodies

Contents

Lami’s theorem to solve equilibrium related problems (for 3 force system), Solve problems applying conditions of equilibrium

Problems

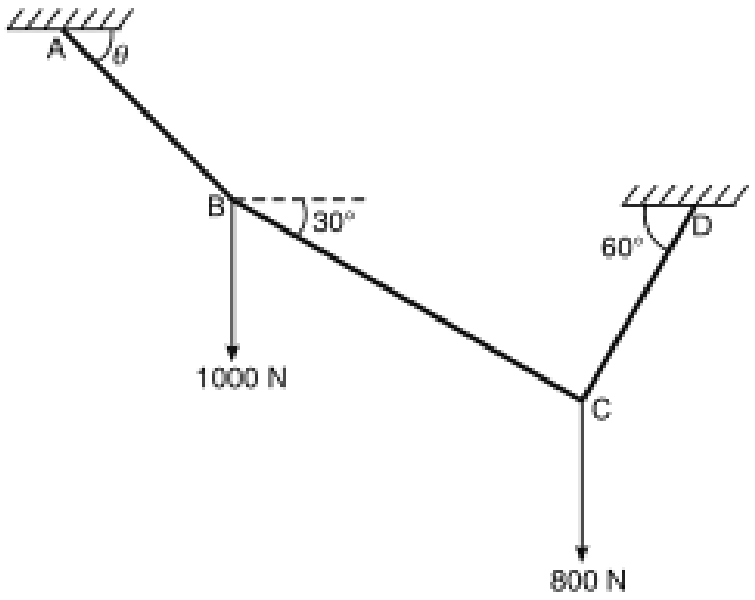
1.A system of connected flexible cables shown in fig is supporting two vertical forces 200N and 250N at points B and D. Determine the forces in various segments of the cable



T_1=224.14N
T_2=183.01N
T_3=336.60N
T_4=326.79N

Problems

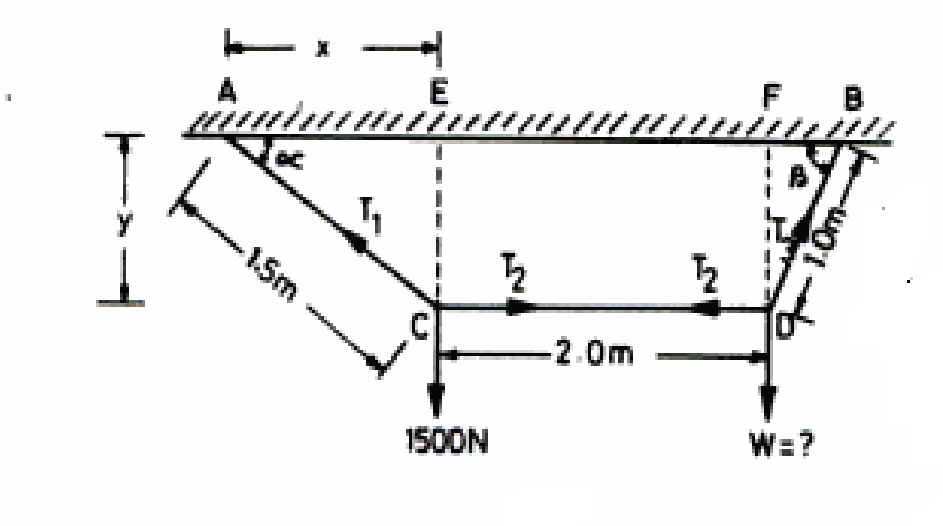
2.Compute the tensions in the string AB,BC,CD as shown in the figure



T_{AB}=1249.158N
T_{BC}=400N
T_{CD}=692.82N

Problems

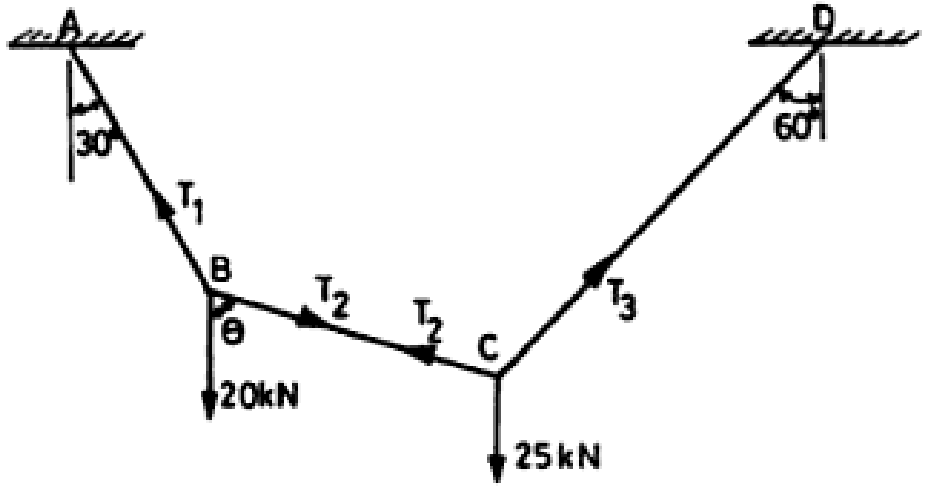
3.A rope AB, 4.5m long is connected at two points A and B at the same level 4m apart. A load of 1500N is suspended from a point C on the rope 1.5m from A as shown in the fig. What load connected at point D on the rope, 1m from B will be necessary to keep the position CD level?



T_1=3098.39N
T_2=2711.09N
T_3=3993.28N
W=2863.53N

Problems

4.A wire is fixed at two points A and D as shown in the figure. Two weights 20kN and 25kN are supported at B and C respectively. When equilibrium is reached it is found that inclination of AB IS 30° and that of CD is 60° to the vertical. Determine the tension in the segments AB,BC and CD of the rope and also the inclination of BC to the vertical.



T_1=38.97kN
T_2=23.84kN
T_3=22.5kN

Summary

- Lami's Theorem states that if a body is in equilibrium under the action of three forces, each force is proportional to the sine of angle between the other forces
- Lami's theorem is applied to solve problems on equilibrium of Coplanar Concurrent Force systems