Unit I

Objective :

1) What is free body diagram of a body?

2) Give an example each of coplanar concurrent forces and coplanar non-concurrent forces.

3) Give an example each of non-coplanar concurrent forces and non-coplanar non-concurrent forces.

4) What is the condition for three forces to be under equilibrium?

5) What is the condition for two forces to be under equilibrium?

6) State parallelogram law of forces.

7) Define moment of force and what is its effect on a body?

8) State Varignon's theorem of moments.

9) Mention different types of loads.

10) Mention different types of supports.

11) Mention different types of beams.

12) Compare resultant of a system of forces with equilibrant.

13) Define a couple with a neat sketch and terminology.

14) Differentiate between rigid and deformable bodies.

15) State the principle of transmissibility of forces.

16) State Lami's theorem.

17) Why is it easier to tighten a nut with a spanner than with bare hand?

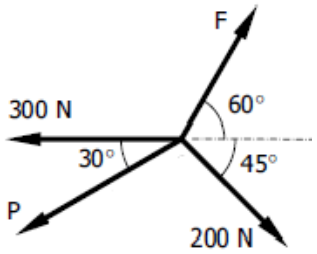
18) What is the difference between moment of a force and moment of a couple?

19) What types of reactions are there in a fixed support of a beam?

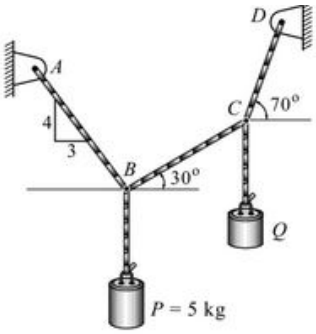
20) Define force and state its characteristics.

Essay Questions

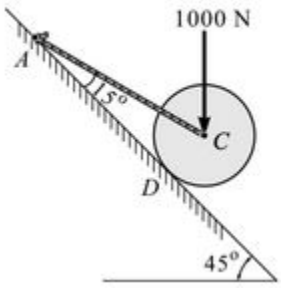
1) Determine the forces P and F in the force system shown in the following figure to be in equilibrium.



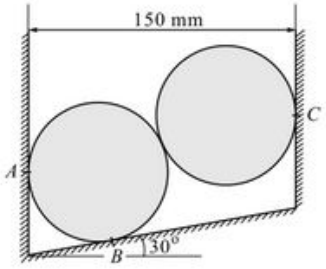
2) The system shown in the following figure is in equilibrium; find out the weight of block Q?



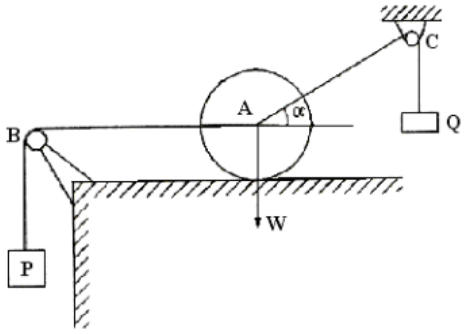
3) A roller of weight 1000 N rests on a smooth inclined plane. It is kept rolling down from the plane by string AC as shown in fig., find out tension in AC and reaction at 'D'?



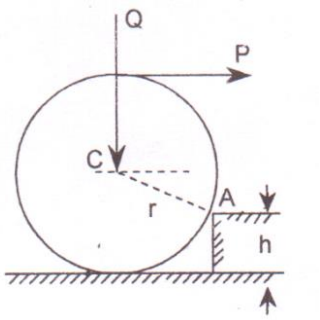
4) Find out the reactions of system shown in the following fig. at A, B and C? Take weight of each roller as 200 N and diameter as 100 mm.



5) A ball of weight W rests upon a smooth horizontal plane and has attached to its centre two strings AB and AC which pass over frictionless pulleys at B and C carry loads P and Q, respectively, as shown in fig. If the string AB is horizontal, find the angle α that the string AC makes with the horizontal when the ball is in a position of equilibrium. Also find the reaction exerted between ball and plane.

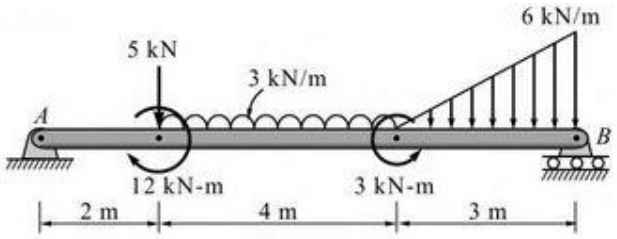


6) A roller of radius r = 0.3 m and weight Q = 2000 N is to be pulled over a curb of height h= 0.15 m by a horizontal force P applied to the end of the string wound round the circumference of the roller. Find the magnitude of P required to start the roller over the curb.



Find out reactions at the supports of following beams?

7)



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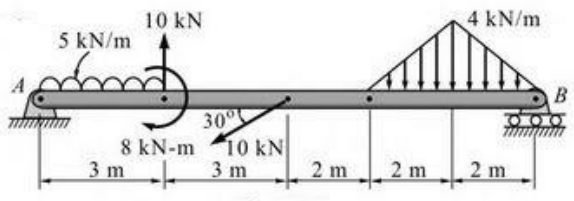

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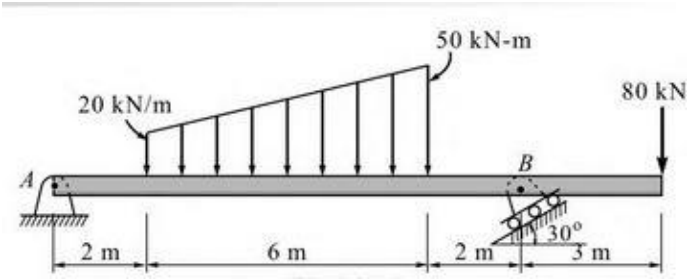

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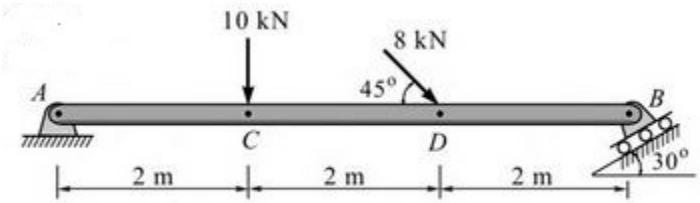


Unit II

Short Questions

1) Define the term friction.

2) What are the different types of friction.

3) How can friction be reduced?

4) Why does rough surface offer more friction than a smooth surface.

5) What is meant by limiting friction?

6) What are the factors which affect the friction?

7) What is meant by cone of friction?

8) Define angle of repose.

9) State laws of friction.

10) What is meant by impending motion?

11) In case of a body rotating sue to applied torque, write a mathematical expression for calculating work done.

12) Define work done by a force.

13) State the principle of virtual work.

13) What are the methods of finding virtual work?

14) Define work done by a couple.

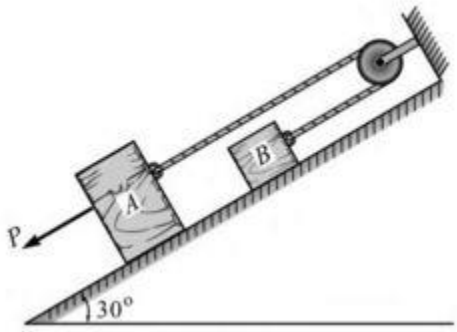
15) What is a wedge and what are its uses?

16) What type of force system is assumed to be acting on a ladder.

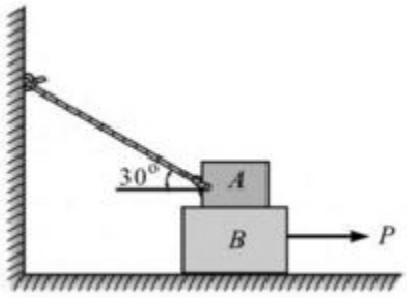
17) How does a ski function?

Essay Questions

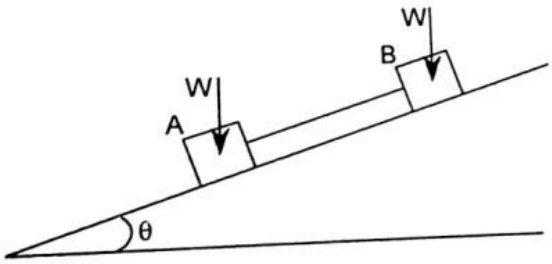
1) Determine the force P required motion to impend. Take mass of block A and B as 9 kg and 4 kg respectively. Coefficient of friction between any block and plane is 0.25. The force P and rope are parallel to the inclined plane. Assume pulley as frictionless.



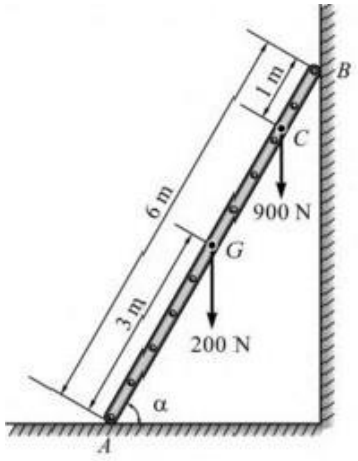
2) Find force P required to just pull block B as shown in fig. coefficient of friction between block A & B is 0.3 and whereas between block B and floor is 0.25. Take mass of A = 20 kg and that of B = 30 kg.



3) Two bodies (A and B) of equal weight are placed on a rough inclined plane and are connected by a string. If coefficient of friction for mass A = 0.5 and for B = 1/3 , Determine the angle at which both the bodies will about to slide.

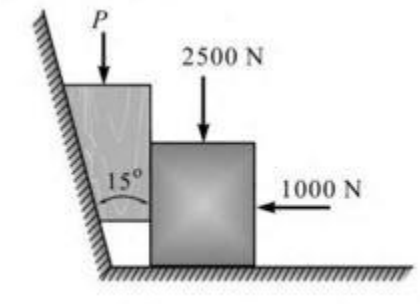


4) The ladder shown in fig is 6 m long and is supported by a horizontal fllor and vertical wall. The coefficient of friction between the floor and the ladder is 0.4 and between wall and ladder is 0.25. The weight of the ladder is 200 N. The ladder also supports a vertical load of 900 N at C, which is at a distance of 1 m from B. Determine the least value of α at which the ladder may be placed without slipping. Also determine frictional force and reactions developed at A & B.

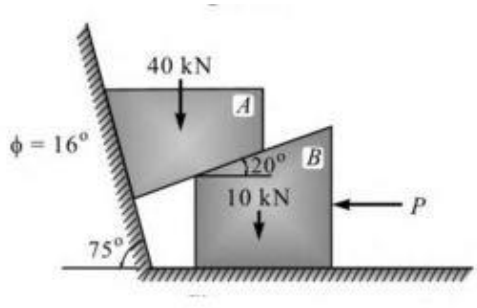


5) A 14 m long ladder rests against a vertical wall, with which it makes an angle of 450 and on a floor. If a man weighing half of that of ladder climbs it, at what distance along the ladder will he be, when the ladder is about to slip? The coefficient of friction between the ladder and the wall is 1/3 and that between the ladder and the floor is ½.

6) Determine the force P required to start the motion of wedge shown in fig. take μ = 0.26 for all contact surfaces.



7) Find out force P applied on block B so as to just start the upward motion of A.



8) Determine the force P required to move the block A of weight 5000 N up the inclined plane. Take μ for all surfaces as 0.25.