Indian Institute of Engineering Science and Technology, Shibpur

B.Tech.(AE, CE, ME, MT, MN, CST, ETC, IT, EE) 2nd Semester Mid-semester Examination, June, 2021

Mechanics (AM 1201)

Full marks: 30 Time:45 Minutes

Notations stand for their usual meanings

Marks of each question are shown in the right

(i) Assume any other data not given in the question.

(ii)Answer Question No. **1** and any **Two** from the rest

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1. [6x1=6]

a) Kinetic friction is lower than static friction. Why?

b) What is tipping and sliding? Explain the criterion for tipping?

c) Wheels of a car are often found to skid during racing. The kind of frictional force acting on it at the moment of skidding is:

(i) Kinetic friction (ii) Rolling Friction (iii) Both the kinetic friction and rolling friction (iv) The information is insufficient

d) What is degree of redundancy in a truss?

e) List all cross brace members (whose presence can be neglected) for the given loading of the truss shown in Fig 1 to convert the tower as statically determinate truss.

f) Three cables are joined at the junction ring C as shown in Fig 2. What will be the tension in cable AC caused by the weight of the 30-kg cylinder hanging through frictionless pulley D.

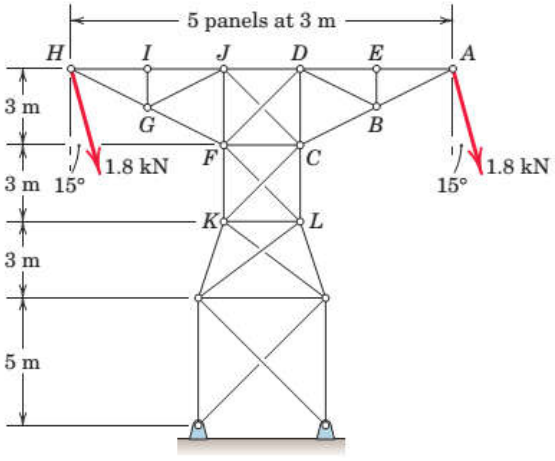

Fig.1

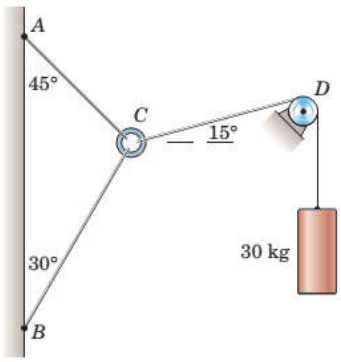

Fig.2

2. Calculate the couple M applied to the lower of the two 20-kg cylinders which will allow them to roll slowly down the incline as shown in below Fig.3. The coefficients of static and kinetic friction for all contacting surfaces are $\mu_s = 0.60$ and $\mu_k = 0.50$. [12]

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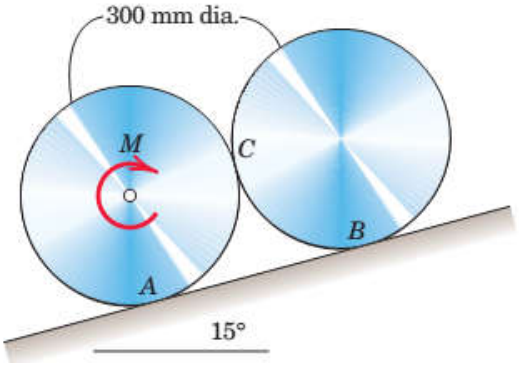

Fig. 3

3. Determine the x- and y-coordinates of the centroid of the shaded area (shown in below in Fig. 4) by direct integration method. [12]

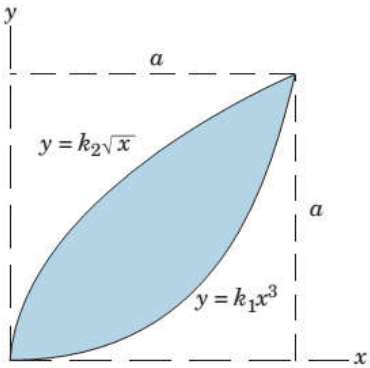

Fig. 4

4. The truss is composed of equilateral triangles of side *a* and is supported and loaded as shown below in Fig 5. Determine the forces in members BC, BG and CG. [12]

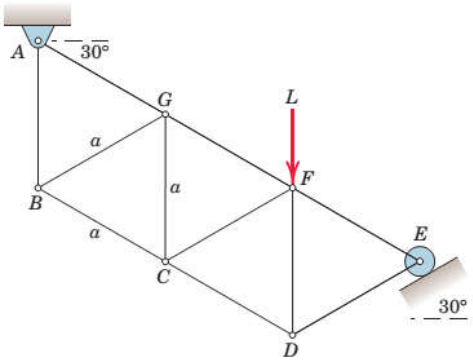

Fig. 5