Exam.Code:0905
Sub. Code: 6649

1078
B.E. (Mechanical Engineering)
First Semester
ME-101: Engineering Mechanics – I

Time allowed: 3 Hours Max. Marks: 50

NOTE: *Attempt five questions in all, including Question No. 1 (Part-A) which is compulsory and selecting two questions each from Part B-C.*

x-x-x

2. Assume any missing data suitably.
3. Supplement your answer with neat and labeled sketches wherever require l.

Part-A

1 (i) The friction experienced by a body, when in motion, is known as ____ _____ friction. (1)

(ii) The term 'force' may be defined as an agent, which produces or tends to produce, destroys or tends to destroy motion. (True / False) (1)

(iii) Value of the coefficient of restitution for elastic bodies is ____. (1)

(iv) The velocity ratio in case of an inclined plane inclined at angle θ to the horizontal and weight being pulled up the inclined plane by vertical effort F is _____ __. (1)

(v) If the resultant of two equal forces has the same magnitude as either of the forces, then the angle between the two forces is ____ degrees. (1)

(vi) A smooth cylinder lying on its convex surface remains in (Stable / Unstable / Neutral) equilibrium. (Select the correct option) (1)

(vii) The unit of angular acceleration is _____. (1)

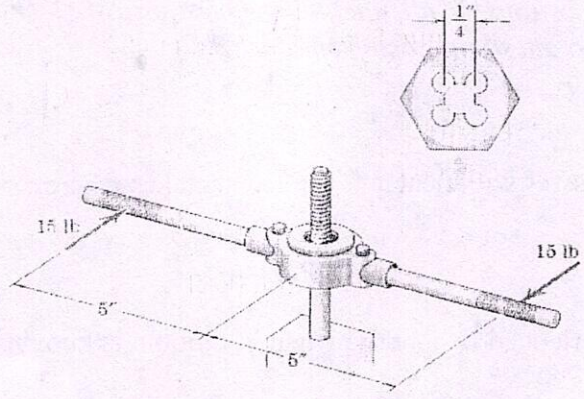
(viii) How does centripetal force differ from centrifugal force? (1)

(ix) If two blocks of equal mass are attached to the two ends of a light string and one of the blocks is placed over a smooth horizontal plane while the other is hung freely after passing over a smooth pulley. then the two blocks will have some motion. (True / False) (1)

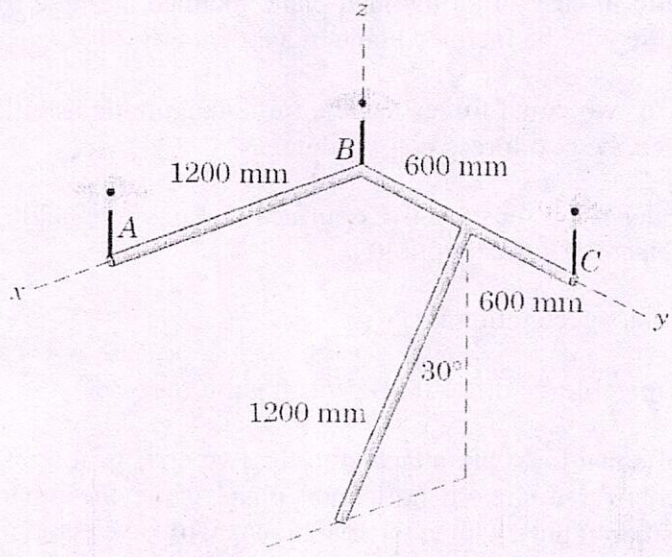
(x) Differentiate between area moment of inertia versus mass moment of inertia. (1)

Part-B

II A die is being used to cut threads on a rod. If 15-lb forces are applied as shown, determine the magnitude F of the equal forces exerted on the ¼ in. rod by each of the four cutting surfaces so that their external effect on the rod is equivalent to that of the two 15-lb forces. (10)



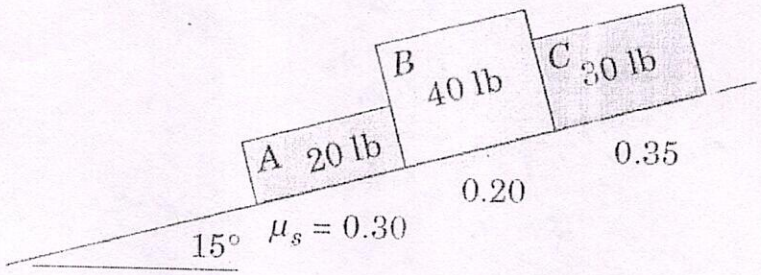
III Each of the three uniform 1200-mm bars has a mass of 20 kg. The bars are welded together into the configuration shown and suspended by three vertical wires. Bars AB and BC lie in the horizontal xy plane and the third bar lies in a plane parallel to the xz plane. Compute the tension in each wire. (10)



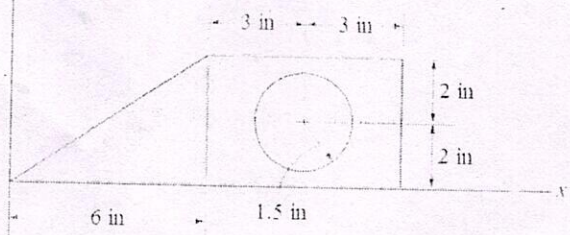
IV Explain the application of method of joints by giving a numerical example. (10)

Part-C

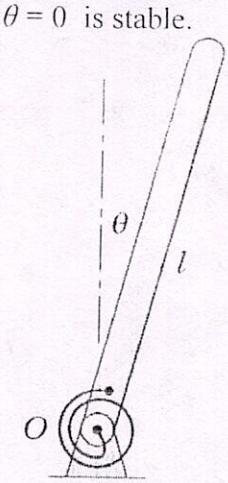
V Three boxes are placed on the incline in contact with each other and released from rest. The coefficients of static friction under boxes *A*, *B*, and *C* are 0.30, 0.20, and 0.35, respectively. Describe what happens. (10)



VI Locate the centroid of the shaded area shown below. The dimensions are in mm. (10)



VII The uniform bar of mass m and length l is hinged about a horizontal axis through its end O and is attached to a torsional spring which exerts a torque $M = k\theta$ on the rod, where K is the torsional stiffness of the spring in units of torque per radian and θ is the angular deflection from the vertical in radians. Determine the maximum value of l for which equilibrium at the position $\theta = 0$ is stable. (10)



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