



b) Derive the Mass moment of inertia of a circular plate of radius R by method of integration.

14. a) A block weighing 2500 N rests on a level horizontal plane for which $\mu = 0.2$. This block is pulled by a force of 1000 N acting at an angle of 30° to the horizontal. Find the velocity of the block after it moves 30 m starting from rest. If the force of 1000 N is then removed, how much further will it move. Use work energy method.

(OR)

- b) A mass 12 kg travelling to the right with a speed of 7.5 m/s collides with another mass 24 kg, travelling to the left with a speed of 25 m/s. If the co-efficient of restitution is 0.6, find the velocities of the particles after collision and loss in kinetic energy. What is the impulse acting on either particle during impact?
15. a) A block of weight 1600 N is in contact with a plane incline 30° to horizontal. A force 'P' parallel to the plane and acting up the plane $\mu = 0.2$. Find
- The value of 'P' to just cause the motion.
 - The value of 'P' to prevent motion.
 - The magnitude and direction of frictional force.

(OR)

- b) A cord is wrapped around a wheel in Fig. 15 (b), which is initially at rest when $\theta = 0$. If a force is applied to the cord and gives it acceleration $a = 4t \text{ m/s}^2$ where t is in seconds, determine, as a function of time, (a) the angular velocity of the wheel and (b) the angular position of line OP in radians.

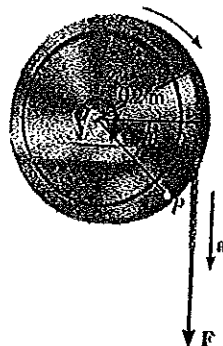


Fig. 15 (b)



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Question Paper Code : 52834

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017

Second Semester

Civil Engineering

ME 2151 – ENGINEERING MECHANICS

(Common to all Branches)

(Regulations 2008)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions.

PART – A

(10×2=20 Marks)

- List any four important Laws used in Engineering mechanics.
- The weight of a boy is 20 kg. Correct the sentence.
- Write Varignon's theorem of moment with proper sketch.
- Using both hands for steering a car, loosening the car wheel bolts are these applications of which concept of mechanics?
- Differentiate centroid and centre of gravity.
- State Pappus Guldinuss theorem for surface area with proper expression.
- A Player pulls his hands towards his body while catching the cricket ball, why?
- Plot a graph for acceleration vs time of a car, moving with uniform velocity.
- Define rolling resistance.
- What do you mean by general plane motion?



11. a) i) The greatest and least resultant of 2 forces acting on a particle is 35 kN and 5 kN respectively. If 25 kN is the magnitude of the resultant for the given system of forces F_1 and F_2 . Prove that the forces are at right angles.
- ii) A disabled automobile is pulled by means of two ropes as shown. Knowing that the tension in rope AB is 3750 N. Determine by trigonometry the tension in rope AC and the value of α , so that the resultant force exerted at A is a 6000 N force directed along the axis of the automobile.

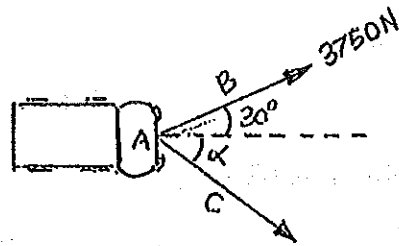


Fig Q. 11.a. ii.

(OR)

- b) A tower guy wire is anchored by means of a bolt at A. The tension in the wire is 2500 N. Determine the components F_x , F_y and F_z of the force acting on the bolt and θ_x , θ_y and θ_z of the force with respect to x, y and z axes.

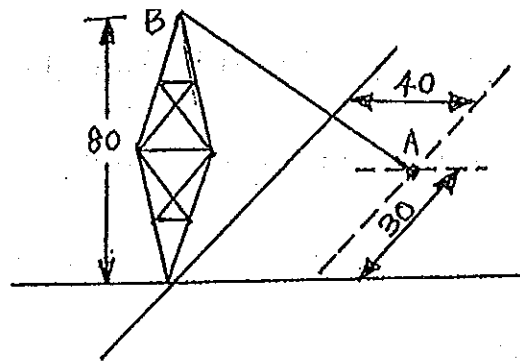


Fig Q. 11.b.

12. a) Two cylinders of diameters 60 mm and 30 mm weighing 160 N and 40 N respectively are placed as shown. Assuming all the contact surfaces are smooth and the horizontal centre to centre distance between the cylinders is 27 mm, find reactions at A, B and C.

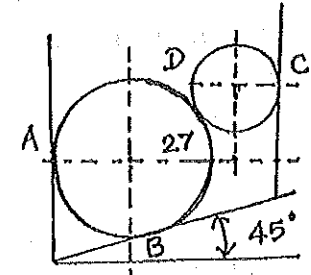


Fig Q. 12.a.

(OR)

- b) A 180 kN vertical force is applied to the end of a lever which is attached to a shaft at 'O'.

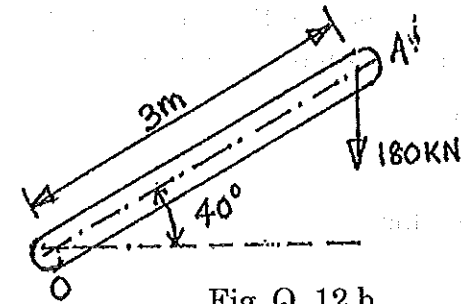


Fig Q. 12.b.

Determine :

- The magnitude of horizontal force applied at A, which creates same moment about 'O'.
 - The smallest force applied at 'A' which creates the same moment about 'O'.
 - How far from the end 'O' a 450 kN force (vertical) must act to create the same moment about 'O'?
13. a) Find the Second moment of area of the following cross section about its centroidal axes.

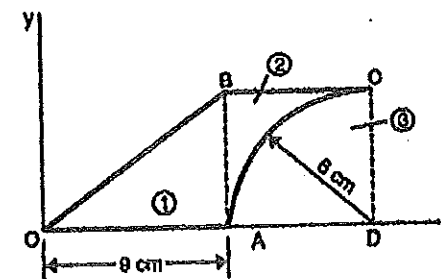


Fig Q. 13.a.

(OR)