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Question Paper Code : X10561

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020
AND APRIL/MAY 2021
Second/Third Semester

Civil Engineering

GE 8292 – ENGINEERING MECHANICS

(Common to Aeronautical Engineering/Aerospace Engineering/Agriculture Engineering/Automobile Engineering/Civil Engineering/Environmental Engineering/Industrial Engineering/Industrial Engineering and Management/Manufacturing Engineering/Marine Engineering/Material Science and Engineering/Mechanical Engineering/Mechanical Engineering (Sandwich)// Mechanical and Automation Engineering/Mechatronics Engineering/Petrochemical Engineering/Production Engineering/Robotics and Automation/Safety and Fire Engineering/Petrochemical Technology/Petroleum Engineering) (Regulations 2017)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions

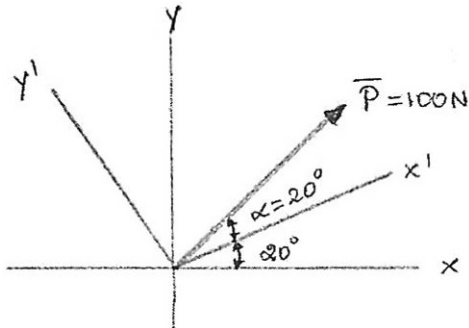
PART – A

(10×2=20 Marks)

1. Define coplanar concurrent forces.
2. Define Lami's theorem.
3. Write the equations of equilibrium of rigid body.
4. Mention the purpose of free body diagram.
5. Write parallel axis theorem.
6. Define Centroid.
7. Write the formula to calculate impulse.
8. Write Newton's second law of motion.
9. Define angle of friction.
10. Write the formula to calculate maximum efficiency in a screw jack.



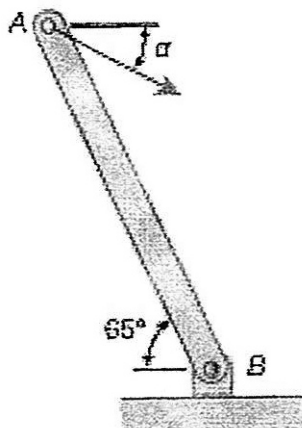
11. a) A force exerted on point A is 100 N in the direction shown in figure 1. Determine the force component acting along (i), the x and y axes (ii), x' and y' axes (iii) x and y' axes and (iv) determine the angle α , knowing that the component of force along x axis to be 80 N while resolving along the x and y' axes. (13)



(OR)

- b) The extremities A and D of a light inextensible string ABCD are tied to two points in the same horizontal line. Weights W and 3W are tied to the string at the points B and C respectively. If AB and CD are inclined to the vertical at angles 60° and 30° respectively, show that BC is horizontal and find the tensions in the various parts of the string. (13)

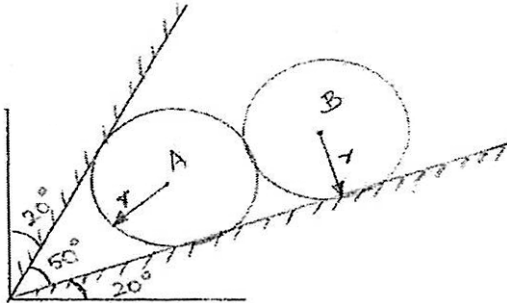
12. a) A 150 N force is applied to the control rod AB as shown in Figure. The length of the rod is 275 mm and $\alpha = 25^\circ$. Determine the moment of the force about point B. (13)



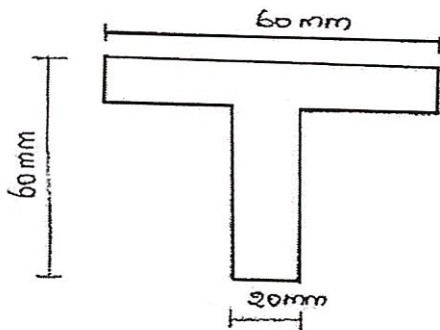
(OR)



- b) Two smooth balls A and B having mass of 2 kg and 5 kg respectively rest between the inclined plane. Determine the reactions of planes on balls. The radius of both the balls is same. (13)

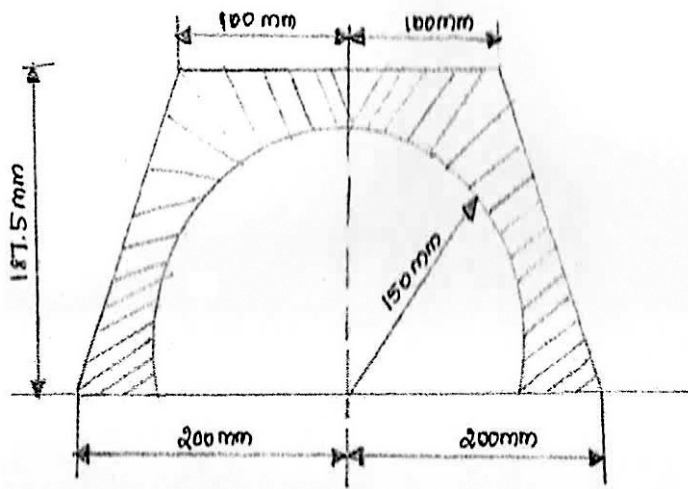


13. a) Calculate the moment of inertia about the horizontal and vertical gravity axes of the section shown in figure. (13)



(OR)

- b) Determine the centroid of the shaded area shown in figure. (13)

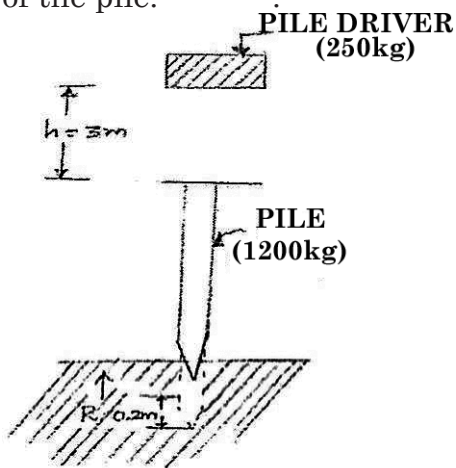


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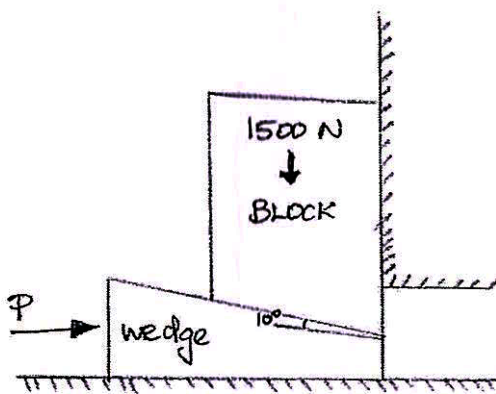


14. a) A pile driver of mass 250 kg falls on a pile of mass 1200 kg. The pile is driven 0.2 m into the ground. Determine the common velocity of the pile and the driver after the impact and average resistance of the ground to the penetration of the pile. (13)



(OR)

- b) Three perfectly elastic balls A, B and C of masses 4 kg, 8 kg and 16 kg move in the same direction with velocities of 8 m/s, 2m/s and 1.5 m/s respectively. If the ball A impinges with the ball B, which in turn impinges with the ball C, prove that the balls A and B will be brought to rest by the impacts. (13)
15. a) A block overlying a 10° wedge on a horizontal floor and leaning against a vertical wall and weighing 1500 N is to be raised by applying a horizontal force to the wedge. Assuming the coefficient of friction between all the surfaces in contact to be 0.3, determine the minimum horizontal force to be applied to raise the block. (13)



(OR)

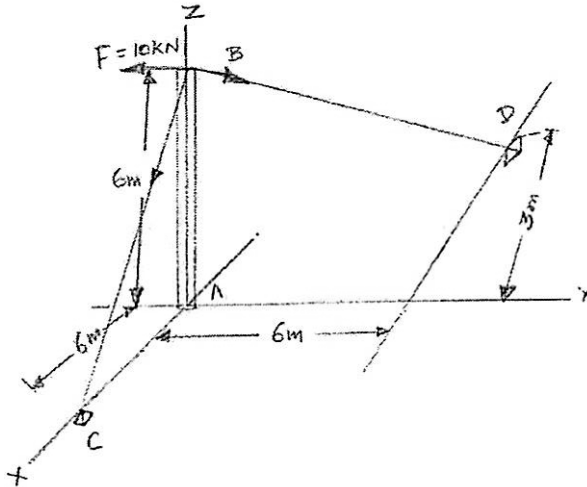
- b) i) A pulley starting from rest to accelerating uniformly reaches a speed of 860 rpm in 14 sec. Calculate its acceleration in revolution per sec² and number of revolution made. (7)
- ii) Explain the types of friction. (6)



PART – C

(1×15=15 Marks)

16. a) Determine the tension in cables BC and BD and the reactions at the ball and socket joint a for the mast shown in figure. (15)



(OR)

- b) Calculate the principal moment of inertia and directions of principal axes for the angle section shown in figure. (15)

