Cat. No: Iden. 1101

Title: Engineering Mechanics (2+1)

Marks: 50.00

Time: 2 hours

I. Answer the following questions (10 *1= 10 marks)

1. Define law of triangle of forces?

2. what is meant by like vector?

3. The equation for resultant of two forces P and Q acting at an angle Θ is.....................?.

4. A couple can be balanced by a force equal to its magnitude...................(agree/ disagree)

5. If the sum of all the forces acting on a body is zero, then the body may be in equilibrium, provided the forces are (concurrent/parallel/like parallel/unlike parallel)

6. The efficiency of a screw jack may be increased by (increasing the pitch/ decreasing the pitch/increasing the load/ decreasing the load)

7. State principle of virtual work?

8. Assume that a body is projected upward from any point, then the body while coming down at the same point will have the same velocity with which it was projected upward (agree/ disagree)

9. What do you mean by angle of repose?

10. What is the relation between angular velocity and linear velocity?

II. Write answer any Five question   (5 x 2=10)

1. A screw eye is subjected to two forces, F1 and F2. Determine the magnitude and direction of the resultant force fig1)?
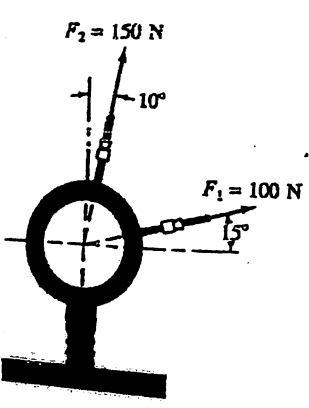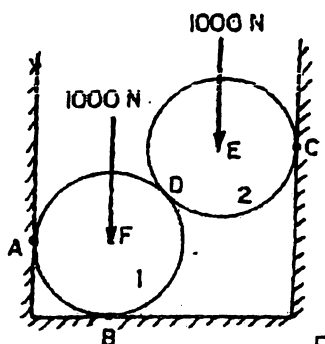

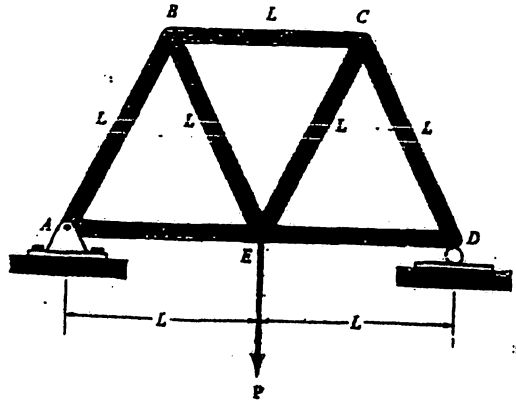Fig (1)   Fig.(2)   Fig.(3)

. What is Mohr's circle and what is it's use?

3. Two spheres each of weight 1000 N and of radius 25 cm rest in a horizontal channel of width 90cm as shown in Fig.(2). Find the reactions on the points of contact A,B and C?

4. If a ball is thrown upwards 8m into the air before it starts to fall, determine its initial velocity and the total time of flight.

5. A sphere of mass 4 kg moving with a velocity of 5 m/s collide with a sphere of mass 3 kg moving with 4 m/s in the same direction. Find their velocity after the impact. Assume $e = 0.5$.

6. A cyclist riding on a level road has to turn a corner of radius 50m. Find the maximum speed with which he can travel without the fear of skidding? What is the angle he shall make while negotiating the corner? Assume coefficient of friction between the tyres and track is 0.15
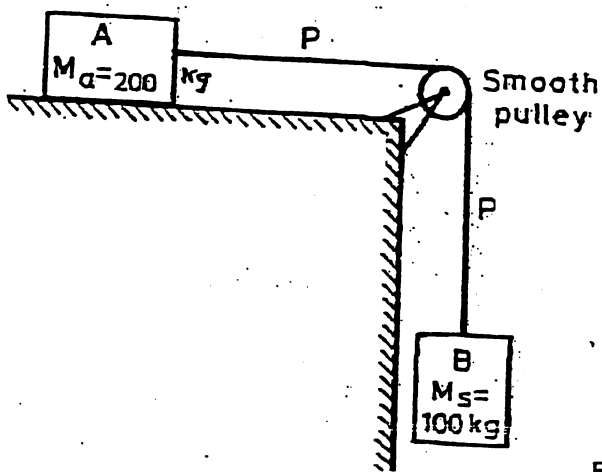
7. State and explain Varignon's theorm.

III. Write answer any Five question

(5 x 4=20)

1. Determine the force in each member of the truss shown in fig(3). Indicate the members are in tension or compression. Assume P= 1000N and L=1m?

2. Find the maximum speed with which a scooter rider leaves a 15^0 ramp at B in order to clear the ditch(fig4)?
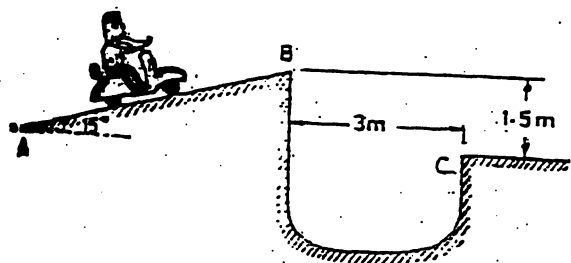
Fig(4)

Fig.(5)

3. Two blocks of masses 200kg and 100 kg are connected by an inextensible string as shown in fig(5). If the coefficient of friction is 0.20, find the acceleration with which the masses move and the tension in the string?

4. A ship A is moving north – west at a speed of 18 km/ hour and the ship B is moving east at a speed 9km/hour. Find the magnitude and direction of the relative velocity of the ship B with respect to the ship A, (fig6)
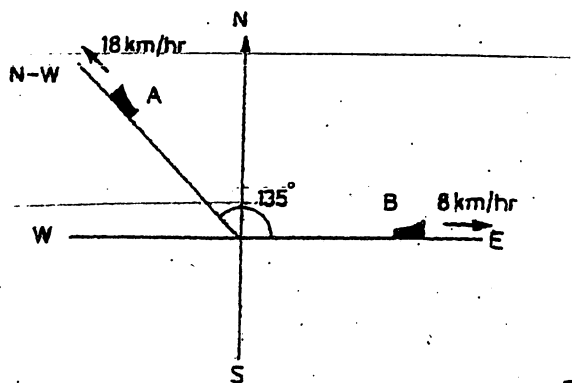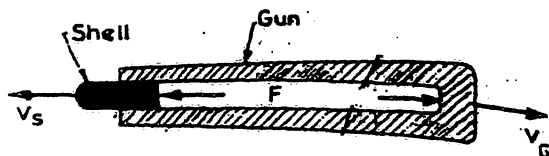

Fig (6)

Fig (7)

5. A gun of mass 3000kg fires horizontally a shell of mass 50 kg with a velocity of 300m/s. What is the velocity with which the gun will recoil? Also determine the uniform force required to stop the gun in 0.6m. In how much time will it stop(Fig7)?

6. A small block of weight W rest on a horizontal turn table at a distance r=1m from the centre of the turn table. Find the maximum uniform speed the block can have without slipping off the table. Assume the coefficient of friction between the block and the turn table to be 0.5 Fig(8)
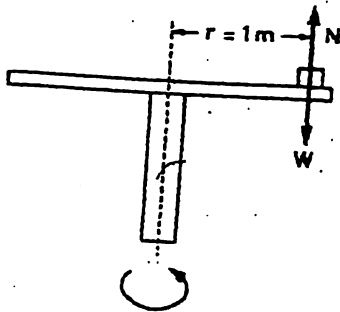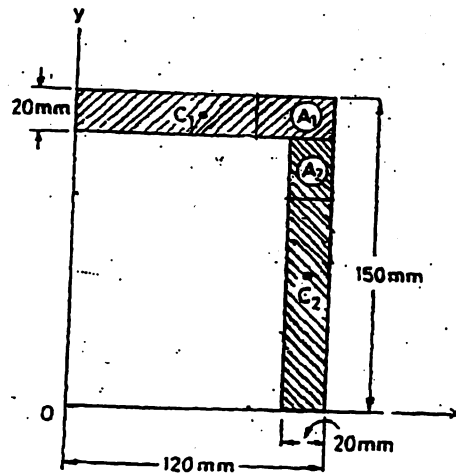

Fig (8)

Fig (9)

7. Find the moment of inertia of the area of the L-section about the centroidal x-axis(fig9).

IV. Answer any one question (1*10 = 10 marks)

1. A block A weighing 2000N resting on a horizontal surface supports a block B weighing 1000N as shown in fig11. The block B is connected to a string which is attached to a vertical wall. Find the horizontal force P, which should be applied on the block A, so as to just move it leftward. Take coefficient of friction as 0.35 at all contact surfaces. Find also the corresponding tension in the string?
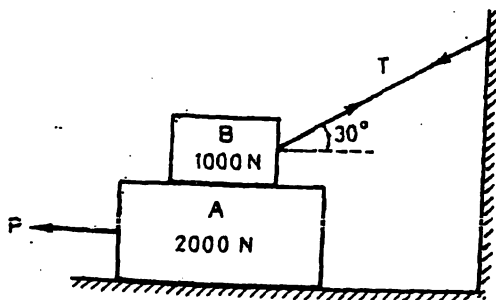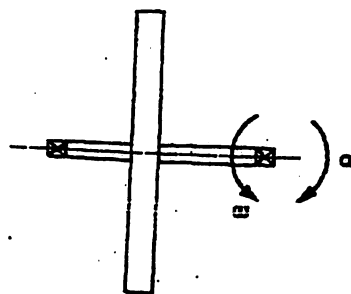

Fig (11)

Fig (12)

2. A grinding wheel has a rated speed of 1500 rpm and can be assumed to be a disc of 0.5 m radius and of uniform thickness. Its weighs 300N. It is made to turn at 1500 rpm and then allowed to decelerate uniformly due to bearing friction. It was observed to come to rest in 120seconds. Determine the number of revolutions that it shall execute before coming to rest and the frictional torque(fig12).