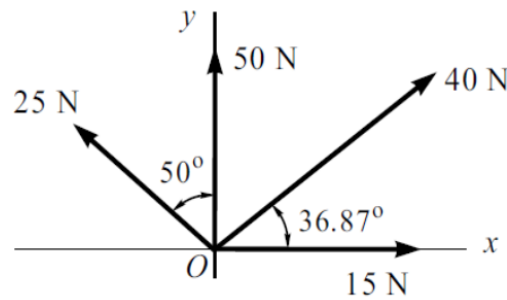


Time: 3Hrs.

Marks: 80

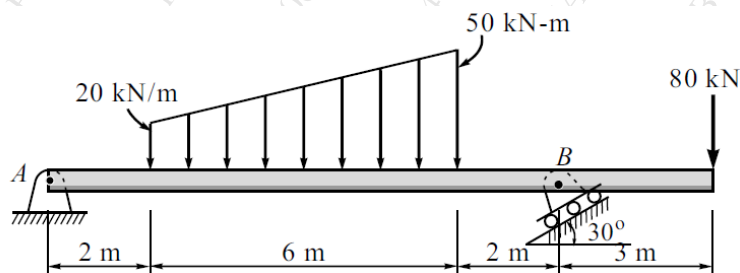
Q.1 Solve Any Four [5x4]

- State and prove Varignon's theorem.
- Determine the resultant of the three forces acting on a hook as shown in Fig.



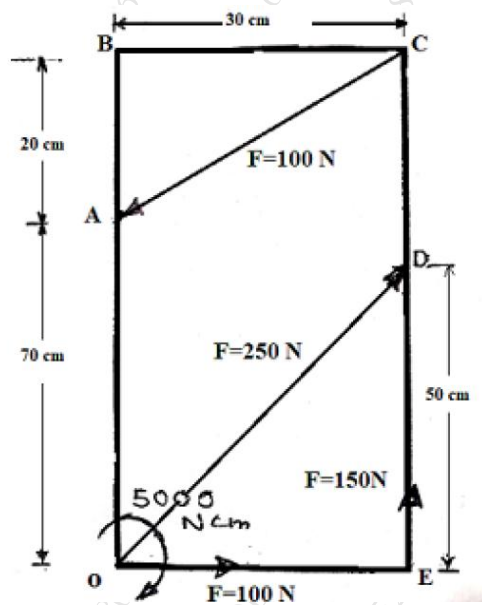
- A block of weight 200 N rests on a horizontal surface. The coefficient of friction between the block and the horizontal surface is 0.4. Find the frictional force acting on the block if a horizontal force of 40 N is applied to the block.
- Rectilinear motion of a particle is defined by the equation $v^3 = x^2$. Determine velocity and acceleration at $x=8$ m.
- Explain general plane motion and ICR with example.

Q2 a) Find the support reactions at A and B for the beam loaded as shown in figure. [8]

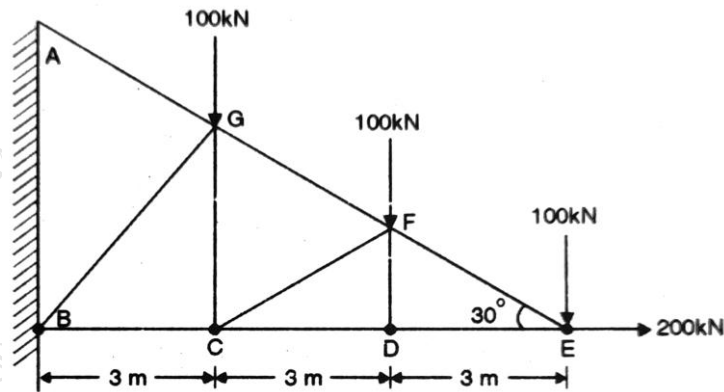


- A ball is projected from the top of a tower of 110 m height with a velocity of 100 m/s and at an angle of elevation 25 degrees to the horizontal. determine [6]
 - The maximum height the ball will rise from the ground.
 - The horizontal distance it will travel just before it strikes the ground.

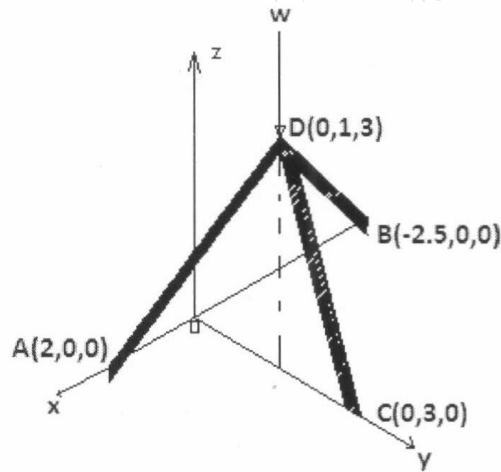
- c) For the system shown in fig. find resultant and its point of application with respect to point O on the X axis (X intercept). [6]



- Q.3 a) A The truss is loaded and supported as shown in figure. Identify zero force members, find forces in members EF, ED and FC by method of joint, find forces in members GF, GC, and BC by method of section [8]

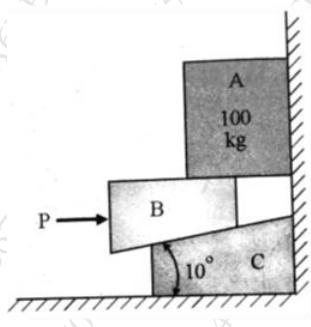


- b) The tripod shown in figure supports a vertical load $W=100$ KN. Find the compressive force acting on each member. All joints are ball and socket type. [6]

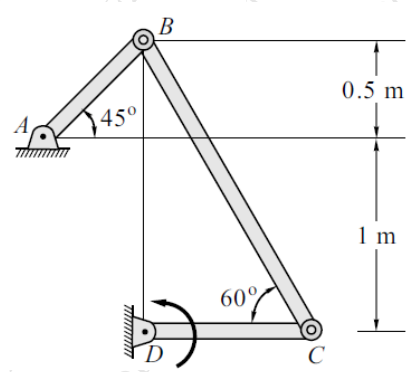


c) A particle travels on a curved path whose arc distance travelled is defined by moves along a circle of radius 20 cm so that $x = 0.5t^3 + 3t$ m. If the total acceleration is 10 m/s^2 at $t=2$ sec, find radius of curvature. [6]

Q.4a) Two 10° wedges of negligible weight are used to move a block of mass 100 kg. If $\mu=0.25$ at all surface of contact. Find the smallest force P that should be applied to one of the wedges. [8]

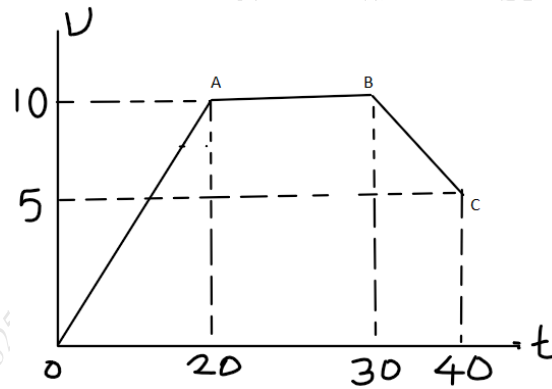


b) In the mechanism shown in fig angular velocity of rod DC is 30 degrees / sec. Determine angular velocity of CD and AB [6]

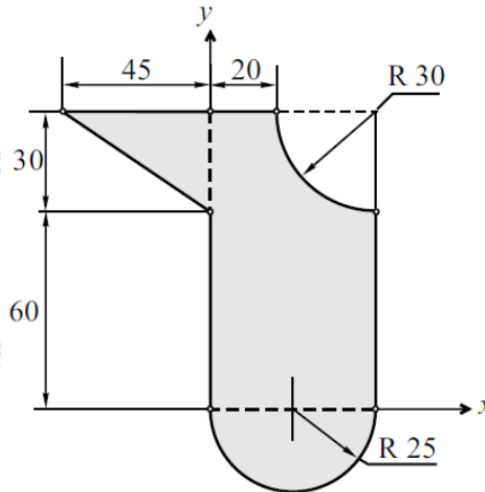


c) Derive equation of trajectory followed by projectile. [6]

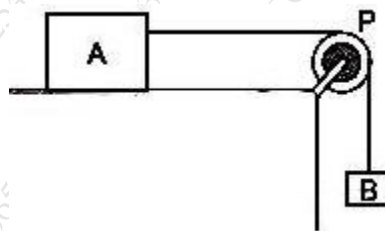
Q.5 a) The velocity time graph for a particle moving along a straight line is shown in figure, Plot x-t and a-t diagram. [8]



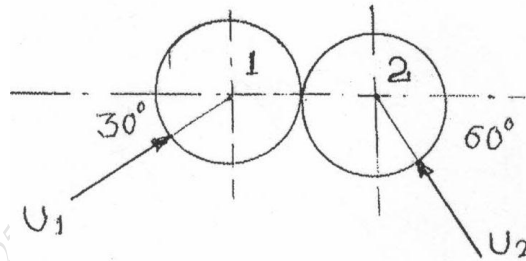
b) Determine Centroid of shaded area w.r.to given coordinates. [6]



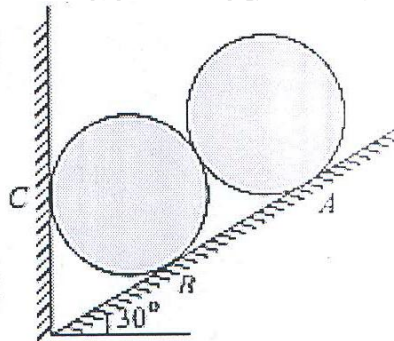
c) Determine the acceleration of blocks shown in figure. If the coefficient of kinetic friction is 0.2 at all surfaces. The block A and B have masses of 90 Kg and 45 Kg. [6]



Q.6 a) Two smooth spheres 1 and 2 having a mass of 2 kg and 4 kg respectively collide with initial velocities 2 m/s and 4 m/s respectively as shown in figure. If the coefficient of restitution for the spheres is 0.8, determine the velocities of each sphere after collision. [8]



b) Two identical rollers of mass 50 Kg are supported as shown in fig. To maintain the equilibrium, determine support reactions. [6]



c) A 20 N block is released from rest. It slides down the rough incline of coefficient of friction 0.2. Determine the maximum compression of the spring. Take stiffness of spring, k as 1000 N/m. [6]

