masterranjeet.com

Code : 011201

B.Tech 2nd Semester Examination, 2017

Engineering Mechanics

Time : 3 hours *Full Marks : 70*

Instructions :

*(i) There are **Nine** Questions in this Paper.*

*(ii) Attempt **Five** questions in all.*

(iii) Question No. 1 is Compulsory.

(iv) All questions carry equal marks.

1. Answer any **Seven** from the following.

(i) What is the principle of transmissibility of a force?

(ii) Discuss Varignon's Theorem.

(iii) What do you mean by Free Body Diagram?

(iv) Why does friction between two contacting solid bodies occur?

(v) Explain method of joints used in plane truss analysis.

(vi) Give the statements of Chasle's theorem.

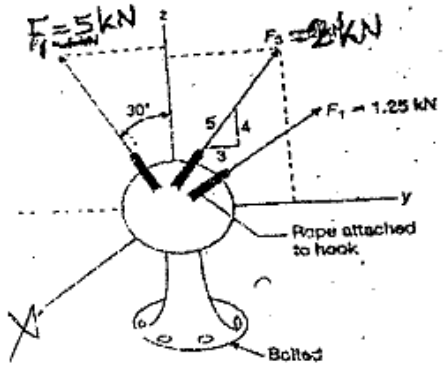
(vii) How the instant centre of zero acceleration of a rigid body is determined?

(viii) Discuss the law of conservation of mechanical energy for Conservative system.

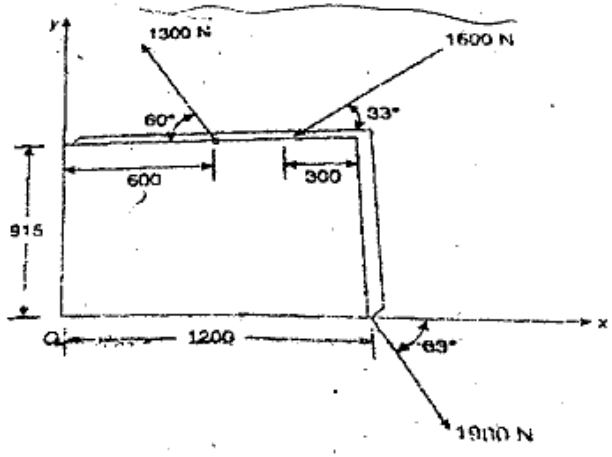
(ix) Establish a relation between coefficient of restitution and velocities of the bodies.

(x) Differentiate between rectilinear translation and curvilinear translation.

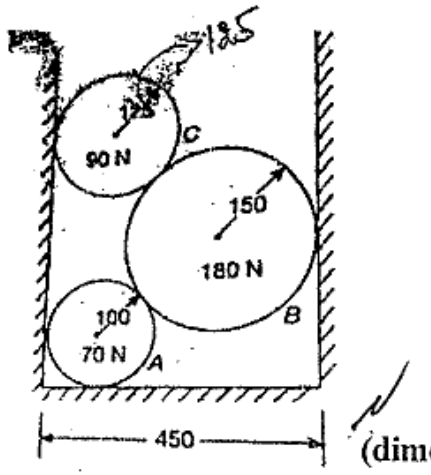
2. The joint subjected to three forces as shown in Fig. Express each force in Cartesian vector form and determine the magnitude and direction angles of resultant force.



3. A coplanar system of force acts on a flat plate. Determine the resultant and its location in the x-y plane.

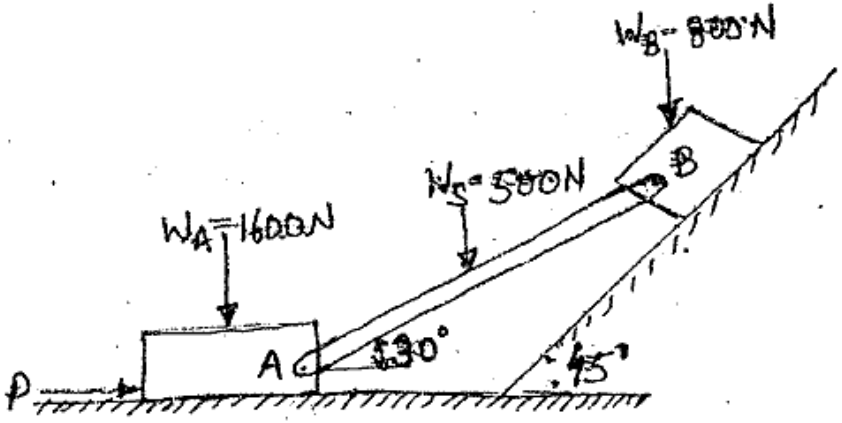


4. Three cylinders are arranged in a rectangular ditch as shown in Fig. Find the reaction between cylinder A and the vertical wall. Neglect friction between contact surfaces.

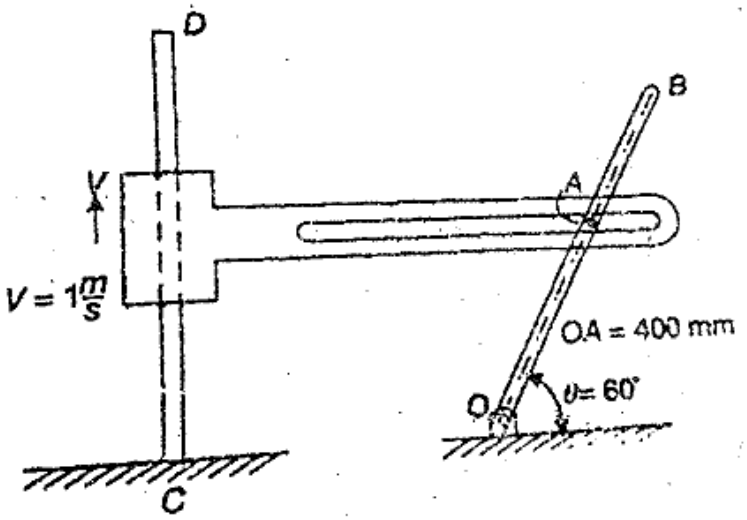


(dimension in mm)

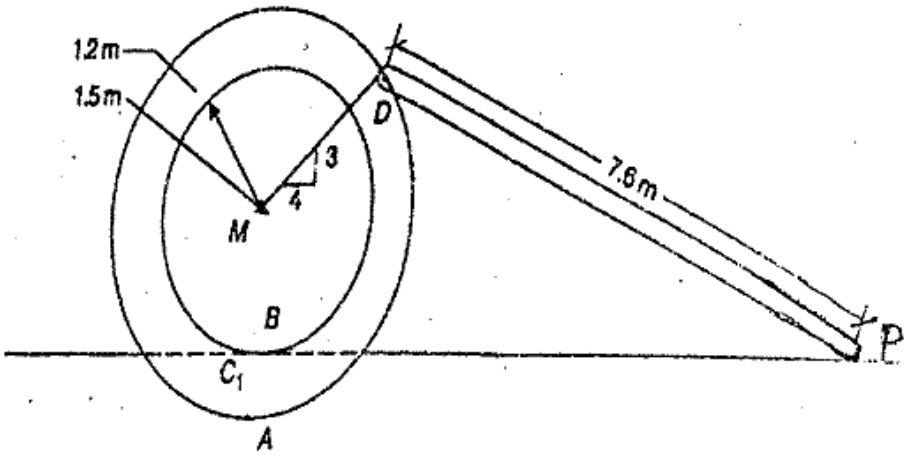
5. A strut weighing 500N is joined to two bodies with frictionless pins. The coefficient of friction under each body is 0.30. Determine the value of the horizontal force P that will start the system moving towards the right.



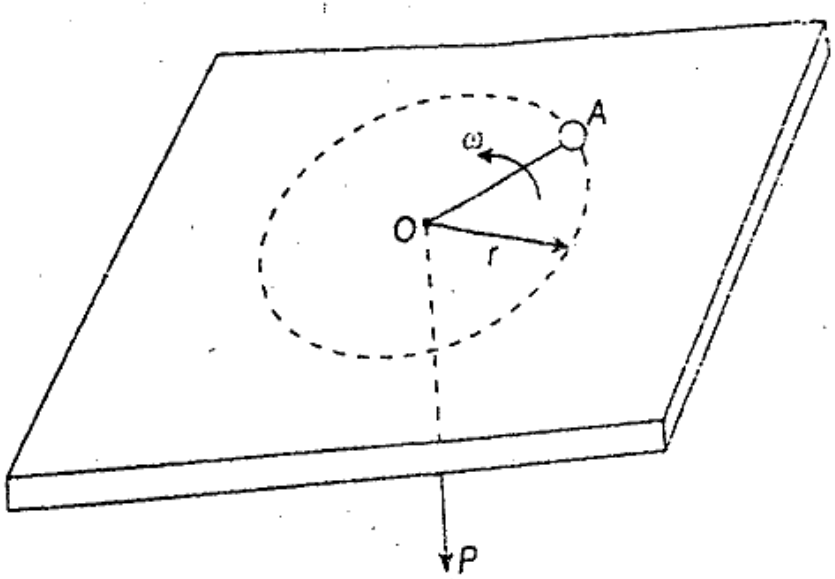
6. The link OB as shown in Fig. is pinned at O making an angle of 60°. The link carries a pin at A at a distance OA=400 mm.pin A slides in horizontal slot in the bar which slides along a fixed vertical bar CD at constant 1m/s velocity. At the instant when $\theta = 60°$, determine the x-component of velocity and acceleration of the pin A.



7. A wheel rolls on the horizontal surface without slipping on its 2.4 m diameter hub at B. A rigid line DE is pinned to the outer diameter of the wheel at D and slides along the horizontal surface. Find the velocity of E, if the velocity of A=3 m/s to the right, by the method of instantaneous canters.

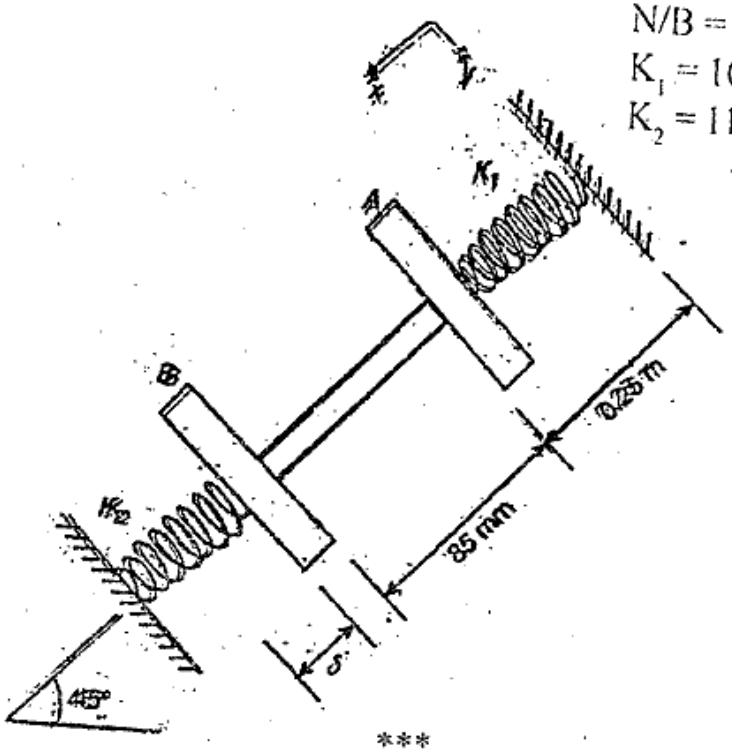


8. A particle of mass 0.5kg moves in a circular path of radius 500 mm on a frictionless horizontal plane. A string is attached to the particle. The other end of the string passes through a hole at the centre of the plane as shown in Fig. Initially, the angular velocity of the string and the particles is 4 rad/sec. The string is pulled down through the central hole so that the radius of the circular path of the particle reduces to 250 mm. Determine the new angular velocity of the string. Determine the work performed by the force P. Calculate the ratio of the final tension in the spring to the initial tension.



9. Along in inclined rod, two cylinders are free to slide without friction. Two springs are attached to the cylinders as shown in Fig. Spring K_1 is upstretched initially while spring K_2 is initially stretched. As cylinder A is released from rest, impact with cylinder B which is at rest occurs. The coefficient of restitution between the two cylinders is 0.8. The springs may be assumed massless. (a) How much is spring K_2 compressed initially? (b) How much does cylinder B displace, following impact to reach its lowest position?

$N/A = 550$ N
N/B = 850 N
$K_1 = 1050$ N/m
$K_2 = 11500$ N/m



***