

II B.TECH – I SEM EXAMINATIONS, NOVEMBER - 2010
ENGINEERING MECHANICS
(CHEMICAL ENGINEERING)

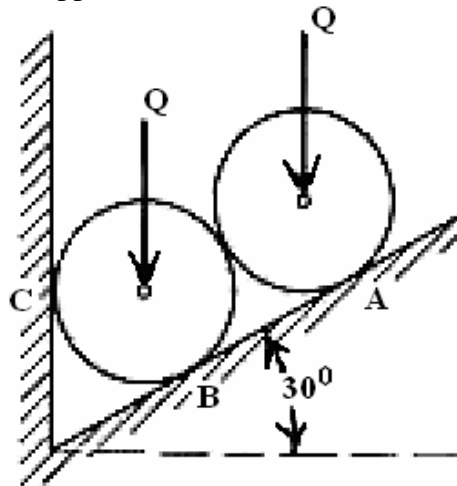
Time: 3 hours

Max.Marks:80

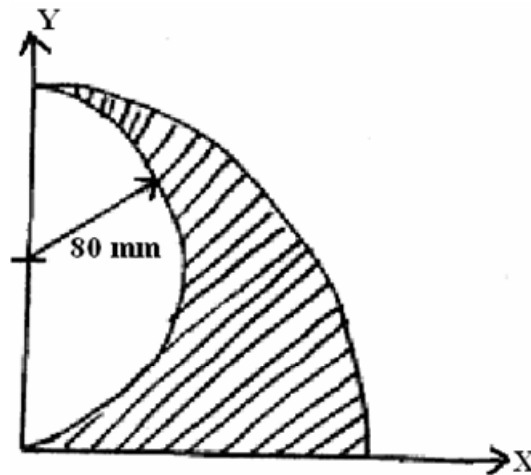
Answer any FIVE questions
All questions carry equal marks

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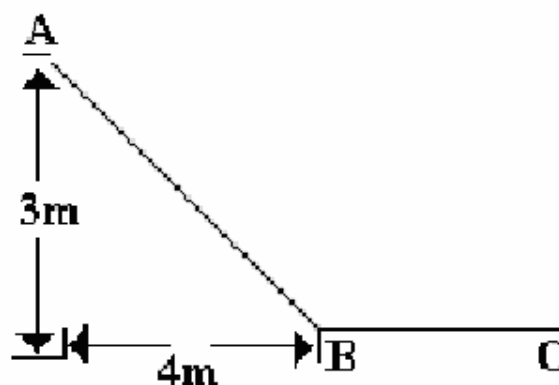
1. a) Define free body diagram, Transmissibility of a force and resultant of a force.
- b) Two identical rollers, each of weight 100 N, are supported by an inclined plane and a vertical wall as shown in figure. Assuming smooth surfaces, find the reactions induced at the points of support A, B and C. [6+10]



2. a) Explain the principles of operation of a screw-jack with a neat sketch.
- b) Outside diameter of a square threaded spindle of a screw Jack is 40mm. The screw pitch is 10mm. If the coefficient of friction between the screw and the nut is 0.15, neglecting friction between the nut and collar, determine
 - i) Force required to be applied at the screw to raise a load of 2000N
 - ii) The efficiency of screw jack
 - iii) Force required to be applied at pitch radius to lower the same load of 2000N and
 - iv) Efficiency while lowering the load.
 - v) What should be the pitch for the maximum efficiency of the screw? and
 - vi) What should be the value of the maximum efficiency? [6+10]
3. An open flat belt drive connects two parallel shafts 1200mm apart. The driving and driven shafts rotate at 350 r.p.m and 140 r.p.m respectively and the driven pulley is 400 mm in diameter. The belt is 5mm thick and 80 mm wide. Coefficient of friction between belt and pulley is 0.3 and maximum permissible tension in the belting is 1.4 N/mm^2 . Determine.
 - a) Diameter of driving pulley.
 - b) Maximum power that may be transmitted by the belting and
 - c) Required initial tension in the belt. Neglect centrifugal tension. [16]
- 4.a) Differentiate between centroid and center of gravity.
- b) Determine the product of inertia of shaded area as shown in figure about the x-y axis. [6+10]



5. Determine the mass moment of inertia of a thin equilateral triangular plate of mass 'm' and thickness 't' about the axis perpendicular to the plane of the plate and passing through the mass center. Base width = 'b' and height of vertex above base = 'h'. Density of material is 'w'. [16]
- 6.a) Maximum range of a field gun is 2000m. If a target at a distance of 1200m is to be hit, what should be the angle of projection?
- b) A stone dropped into a well is heard to strike the water in 3.5 seconds. Find the depth of the well assuming the velocity of sound is 335 m/sec. [8+8]
- 7.a) A homogeneous sphere of radius of $a = 100$ mm and weight $W = 100$ N can rotate freely about a diameter. If it starts from rest and gains, with constant angular acceleration, an angular speed $n = 180$ rpm, in 12 revolutions, find the acting moment.
- b) A block starts from rest from 'A'. If the coefficient of friction between all surfaces of contact is 0.3, find the distance at which the block stop on the horizontal plane. Assume the magnitude of velocity at the end of slope is same as that at the beginning of the horizontal plane. [8+8]



- 8.a) Explain how a simple pendulum differ from a compound pendulum, briefly with the help of differential mathematical equations.
- b) Determine the stiffness in N/cm of a vertical spring to which a weight of 50 N is attached and is set vibrating vertically. The weight makes 4 oscillations per second. [8+8]
