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Total Number of Pages: 02

B.Tech
BE2104

1ST Semester Back Examination 2017-18
MECHANICS

BRANCH: AEIE, AERO, AUTO, CHEM, CIVIL, CSE, ECE, EEE, EIE, ELECTRICAL, ETC, FASHION, IEE, IT, MECH, MINING, MME, PE, PLASTIC, TEXTILE

Time: 3 Hours

Max Marks: 70

Q.CODE: B1088

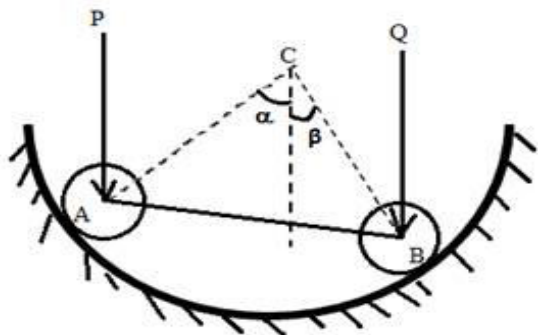
Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 Answer the following questions:

(2 x 10)

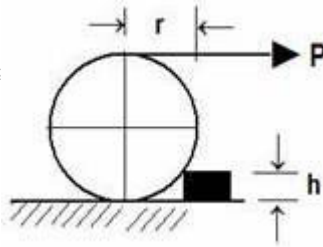
- State Lami's theorem and demonstrate the same by an example.
- State Varignon's theorem.
- Using Pappus theorem find the area of circle.
- State laws of coulomb friction of sliding bodies.
- Define principle of transmissibility
- State the principle of conservation of momentum.
- If the speed of a particle along a curved path is constant, what is the value of tangential acceleration?
- Differentiate truss and frame.
- What are impulse and momentum?
- What is the location of centroid of a cone height 'h' and radius 'r'?

Q2 a) Two roller of weights "P" = 222.5N and "Q" = 445N are connected by a rigid bar at its ends & supported inside a circular ring in a vertical plane as shown in figure. The length of the bar "AB" is such that radii "AC" and "BC" form right-angle at center of the circular ring "C". Neglecting friction and weight of the bar, find the compressive force in the bar "AB". **(5)**



b) A roller of weight 500 N has a radius of 120 mm and is pulled over a step of **(5)**

height 60 mm by a horizontal force P. Find magnitudes of P to just start the roller over the step.



- Q3** a) A uniform ladder of 4 m. length rests against a vertical wall which it makes an angle 45° . If a man, whose weight is half of the ladder, ascends it, how high will it be when the ladder slips? (5)
 (Take $\mu=0.4$ (between ladder and wall) and $\mu=0.5$ (between ladder and floor))
- b) A quarter of circle area is removed from square. Find out the centroid of remaining area. The radius of the circle is same as the side of square. (5)
- Q4** a) A bullet is fired upward at an angle of 30° to the horizontal from a point P on the hill. It strikes the target, which is 80 m lower than P. The initial velocity of bullet is 100 m/sec. calculate the actual velocity with which the bullet strikes the target. (5)
- b) Train A passes a certain station at velocity 72 kmph and moves 20 km at this speed and then comes to rest at next station 24 km away from the first one. Train B, starts from the first station, in accelerate and then decelerate and finally reaches the second station. Time taken by B is twice of the time taken by A. Determine the maximum speed attained by B (5)
- Q5** a) A bullet of mass 30 gm is fired into a body of mass 10 kg, which is suspended by a string 0.8 m. long. Due to this impact, the body swings through an angle 30° . Find the initial velocity of bullet. (5)
- b) State and explain the principle of virtual work with an example. (5)
- Q6** a) Find the maximum constant speed of a car can move (without skidding) around a curve. (5)
 (Take $R=350$ meters and $\mu=0.3$ (between tyre & road))
- b) A flywheel of mass 8 tonnes starts from rest, and gets up a speed of 180 rpm in 3 minutes. Find the average torque exerted on it. (Take radius of gyration is 60 cm.) (5)
- Q7** Find the moment of inertia of a T-section with flange as 200 mm \times 60 mm and web as 200 mm \times 60 mm about X-X and Y-Y axes through the centre of gravity of the section. (10)
- Q8** Write short answer on any TWO: (5 x 2)
- a) Parallel axis theorem
 b) Co-efficient of restitution
 c) D'Alembert principle
 d) Radius of gyration