01328

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)
B.Tech. (AEROSPACE ENGINEERING)

Term-End Examination

December, 2010

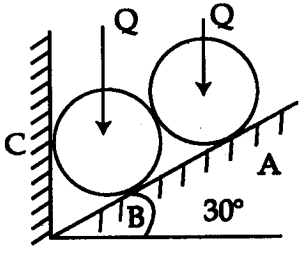
BME-016 : ENGINEERING MECHANICS

Time : 3 hours *Maximum Marks : 70*

Note : *Answer any five questions. Use of calculator is permitted.*

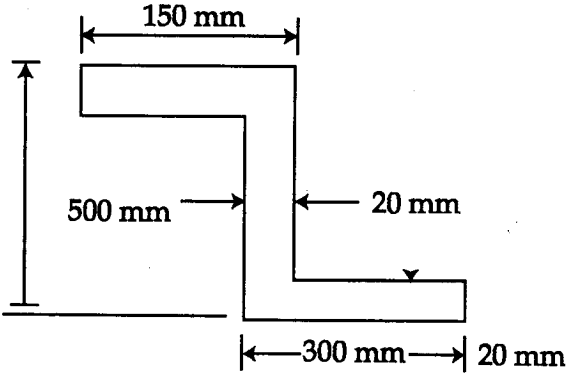
1. (a) Define the body diagram, transmissibility of a force, Lamies theorem, and resultant of a force system. 8

(b) Two identical rollors, each of weight 100 N, are supposed by an inclined plane and vertical wall as shown in figure. Assuming smooth surfaces find the reactions induced at the points A, B and C. 6

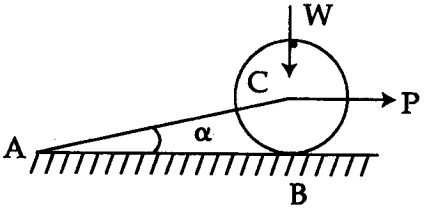


2. (a) Explain parallel and perpendicular axis theorem. 6

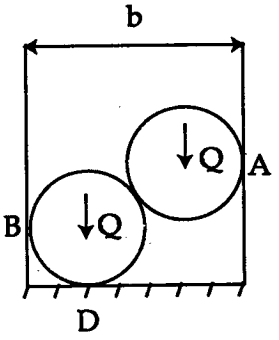
(b) Find the centroid of the Z section. 8



3. (a) A sight circular roller of weight W rests on a smooth horizontal plane and is held in position by an inclined bar AC as shown in figure. Find tension 'S' in the bar AC and the vertical reaction 'R_b' at B if then is also horizontal force 'p' acting at C. 7

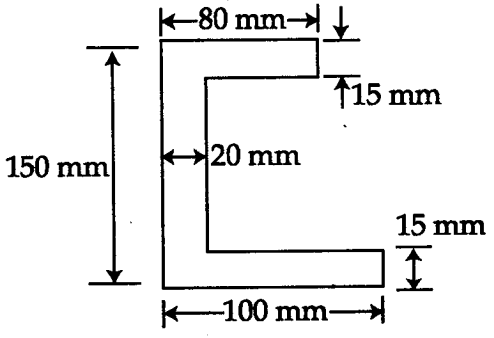


(b) 7

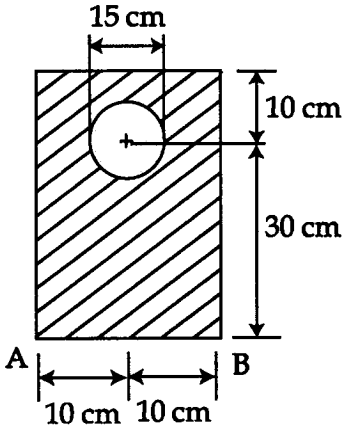


Two smooth spheres, each of radius 'r' and weight Q, rest in a horizontal channel having vertical walls, the distance between which 'b', Find the pressure exerted on the walls and floor at the points of contact A, B and D. The following numerical data is given : r = 25 cm, b = 90 cm Q = 100 N.

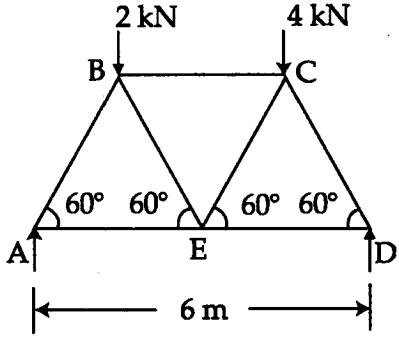
4. (a) Find the centroid of plain Lamina shown below : 7



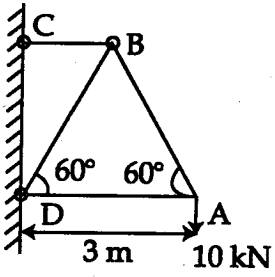
(b) Find the moment of inertia about the horizontal centroidal axis and about its base AB. 7



5. (a) The following figure shown a warrin girder consisting of beam members each of 3 m length simply supported at its end points. 7



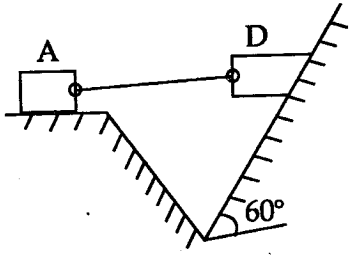
(b) A cantilever truss of 3 m span is loaded as shown in figure. Find the forces in the various members of the truss, and tabulate the results. 7



6. (a) An air plane is flying horizontally with a velocity of 450 km/hr at an attitude of 1960 m towards a target on the ground which is to be bombed. Estimate where the bomb must be released in order to hit the target and the time of travel of the bomb. What is the velocity with which the bomb will hit the target ? Also find the angle made by its line of sight of the pilot when the bomb is released. 7

(b) The acceleration of a particle is defined by the relation a = k1-4. Knowing that u = 4 m/s when t = 2 sec and v = 1 m/s when t = 1 sec, determine the constant 'k'. Write the equations of motion when x = 0 at t = 3 sec. 7

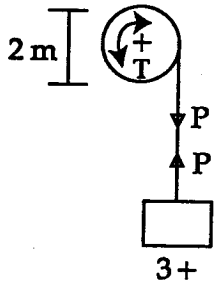
7. (a) Two blocks A and B connected by a horizontal rod and friction less hinges are supported on two rough planes as shown. The 'μ' are 0.3 between block A and horizontal surface and 0.4 between block B and the inclined surface. If the block B weighs 100 N, what is the smallest weight of block A that will hold system in equilibrium. 7



(b) A screw Jack has a thread of 10 mm pitch. What effort applied at the end of a handle 400 mm long will be required to lift a load of 2 kN. If the efficiency at this load is 45%. 7

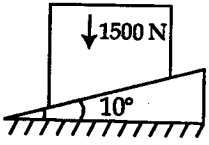
8. (a) A solid cylinder pullers of mass 800 kg having 0.8 m radius of gyration and 2 m diameter is rotated by an electric motor, which exerts a uniform torque of 60 kN-m. A body of mass 3t is to be lifted by a wire wrapped round the pulley. 7

Find (i) acceleration of the body, and (ii) tension in its rope.



(b) A wheel rotates for each 5 seconds with a constant angular acceleration and describes during this 100 radians. It then rotates with a constant angular velocity and during its next fire seconds describes 80 radians. Find the initial angular velocity and the angular acceleration. 7

9. (a) A block weighing 1500 N, lying on a 10° wedge on a horizontal floor and learning again a vest wall is to be raised by applying a horizontal force to the wedge. Assume $\mu = 0.3$. determine the minimum horizontal force required to raise the black. 7



(b) A motor car takes 10 seconds to cover 30 m and 12 seconds to cover 42 m. Find the uniform acceleration of the car and its velocity at the end of 15 seconds. 7