

B.Tech I Year II Semester (R15) Supplementary Examinations December 2018

ENGINEERING MECHANICS

(Civil Engineering)

Time: 3 hours

Max. Marks: 70

PART – A

(Compulsory Question)

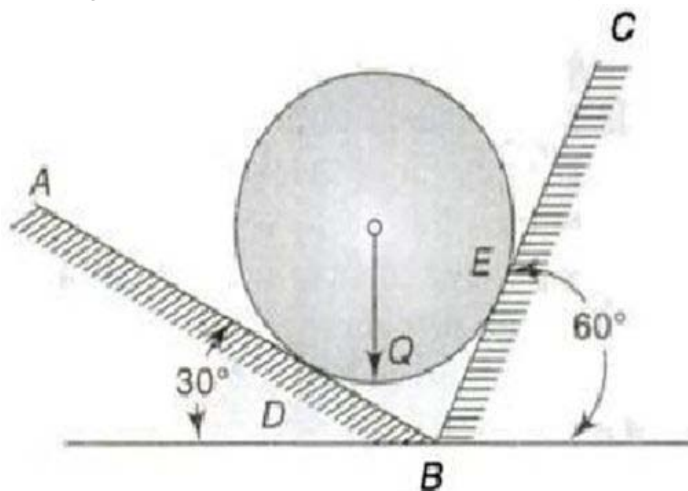
- 1 Answer the following: (10 X 02 = 20 Marks)
- Define and explain the following terms: (i) Coplanar forces. (ii) Non-coplanar forces.
 - What is free body diagram?
 - Explain the laws of friction.
 - Define angle of friction.
 - What is the difference between centroid and Centre of gravity?
 - State Pappus theorem.
 - What is rectilinear motion? Give an example.
 - Define work energy theorem.
 - List the different types of frames.
 - Differentiate between free vibration and forced vibration.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

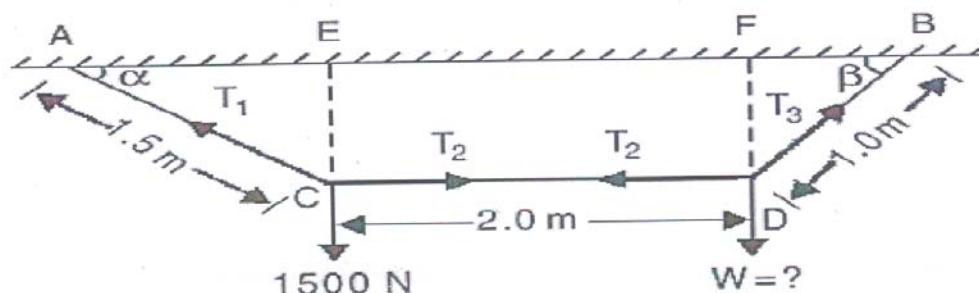
UNIT – I

- 2 A ball of weight $Q = 12 \text{ N}$ rests in a right-angled trough, as shown in figure below. Determine the forces exerted on the sides of the trough at D and E if all surfaces are perfectly smooth.



OR

- 3 A rope AB, 4.5 m long is connected at two points A and B at the same level 4 m apart. A load of 1500 N is suspended from a point C on the rope 1.5 m from A as shown in figure below. What load connected at a point D on the rope, 1 m from B will be necessary to keep the position CD level.



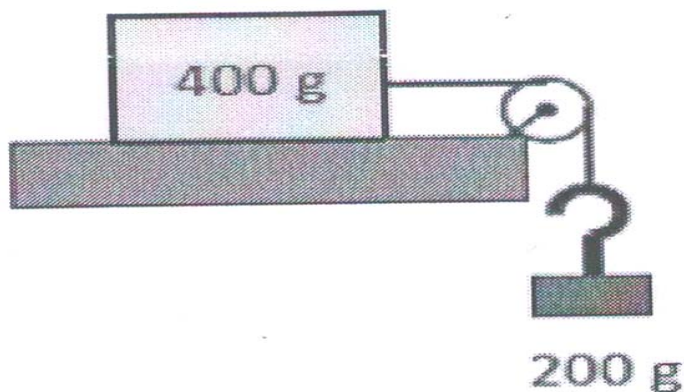
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UNIT – II

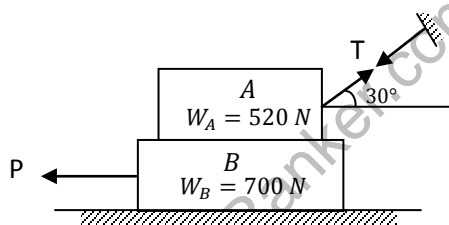
- 4 (a) A load of 3.5 kN is to be raised by screw jack with mean diameter of 75 mm and pitch 12 mm. Find the efficiency of screw jack, if the coefficient of friction between the screw and nut is 0.070.
- (b) A body of weight 500 N is pulled up an inclined plane, by a force of 350 N the inclination of plane is 35° to the horizontal and the force is applied parallel to the plane. Determine the coefficient of the friction.

OR

- 5 (a) A 400 gram package lying on a horizontal surface is attached to a horizontal string which passes over a smooth pulley. When a mass of 200 grams is attached to the other end of the string, the package is on the point of moving. Find the coefficient of friction.

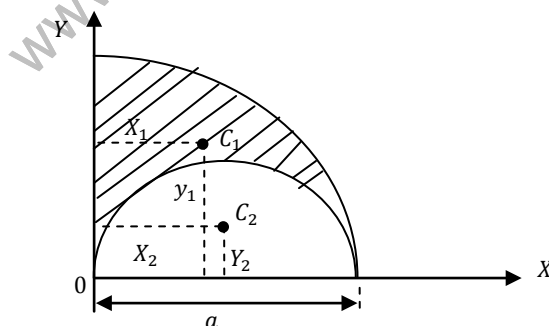


- (b) Block A of weight 520 N rest on the horizontal top of block B having weight 700 N as shown in figure. Block A is tied to a support C by a cable at 30° to the horizontal. Coefficient of friction is 0.45 for all contact surfaces. Determine the minimum value of the horizontal force P just to move the block B. Find also the tension in the cable.



UNIT – III

- 6 Locate the centroid of the shaded area obtained by removing a semicircle of a diameter 'a' from a quadrant of a circle of radius 'a' as shown in figure below.



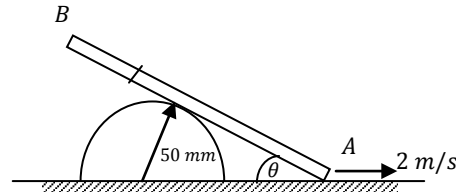
OR

- 7 Calculate the mass moment of inertia of circular plate of radius R and thickness t about its centroidal axis.

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UNIT – IV

- 8 A bar AB remains in contact with the circle of radius 50 mm shown in figure below. If the end A moves with constant velocity of 2 m/s along the horizontal line, determine the angular speed of the bar.

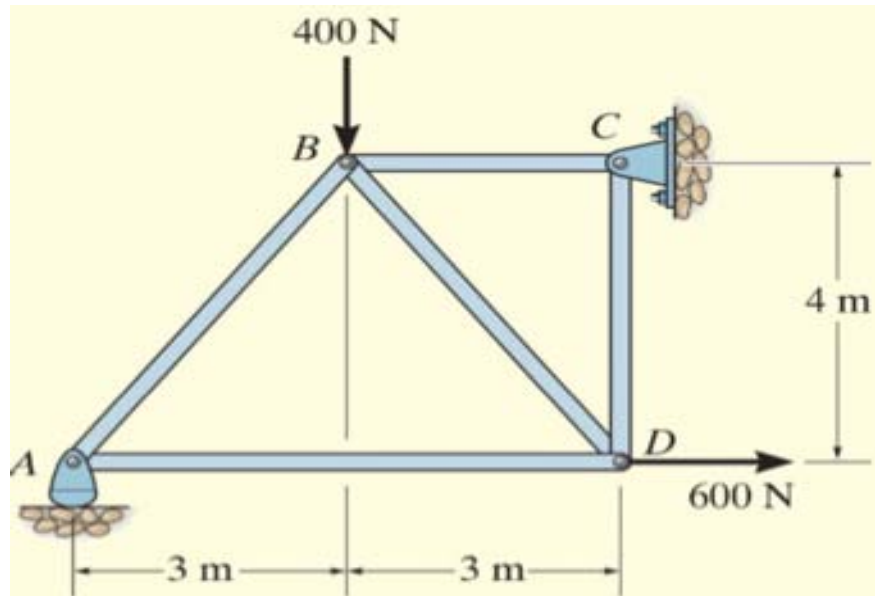


OR

- 9 The plane curvilinear motion of a particle is defined by the equations $x = V_0 t$ and $y = K \cos(2\pi V_0 t/l)$. Find the equation of the path $y = f(x)$. Find the maximum normal acceleration of the particle if $V_0 = 12$ m/s, $K = 1$ m and $l = 8$ m.

UNIT – V

- 10 Determine the force in each member of the truss shown in figure below. Indicate whether the members are in tension or compression.



OR

- 11 A particle is performing SHM when it is at a distance of 10 cm and 20 cm from the mean position its velocities are 1.2 m/sec and 0.8 m/sec respectively find: (i) The amplitude of oscillation. (ii) Time period of oscillation. (iii) Maximum velocity. (iv) Maximum acceleration.
