Code: 13A01101

R13

B.Tech I Year (R13) Supplementary Examinations December 2017

ENGINEERING MECHANICS

(Common to CE and ME)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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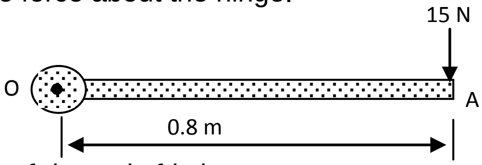
1 Answer the following: (10 X 02 = 20 Marks)

(a) State the principle of transmissibility of forces.

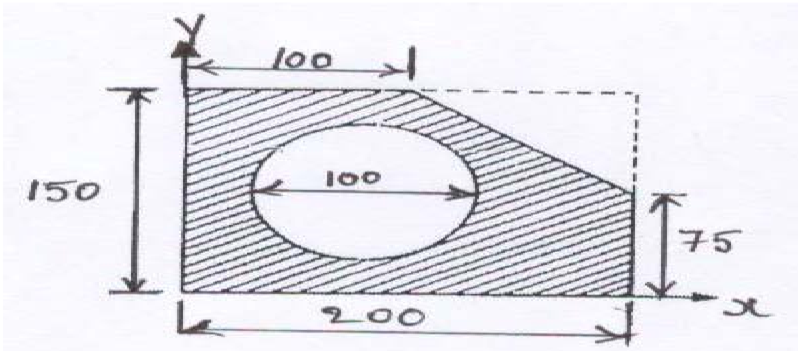
(b) A force of 15 N is applied perpendicular to the edge of a door 0.8 m wide as shown in figure below. Find the moment of the force about the hinge.



(c) List the two types of dynamic friction.

(d) Coefficient of friction between screw and nut in a screw jack is 0.15. Determine the angle of friction.

(e) Locate the centroid of the lamina shown in figure below.



(f) State perpendicular axis theorem with simple sketch.

(g) A body is moving with a velocity of 3 m/s. After five seconds the velocity of the body becomes 13 m/s. Find the acceleration of the body.

(h) A lift carries a weight of 100 N and is moving with a uniform acceleration of 2.45 m/s^2. Determine the tension in the cables supporting the lift when the lift is moving upwards.

(i) List any two assumptions made in the analysis of frames.

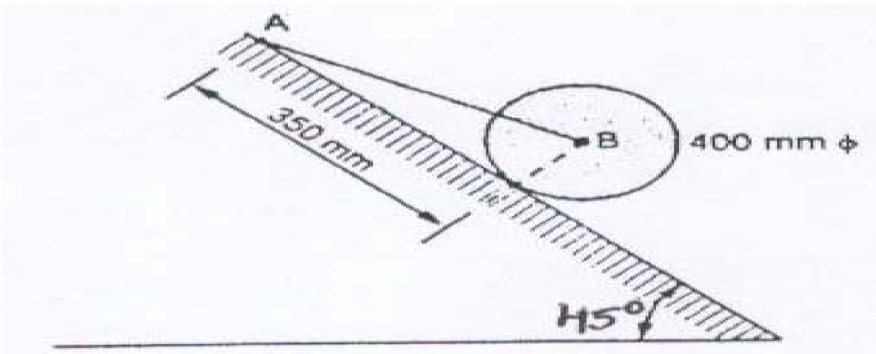
(j) A simple harmonic motion is defined by the expression a = -15s. Determine its period and frequency.

PART – B

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

UNIT – I

2 A 40 kg cylinder is held in position on an inclined plane by means of a wire as shown in figure below. Determine reaction at surface of inclined plane and tension in the wire.



OR

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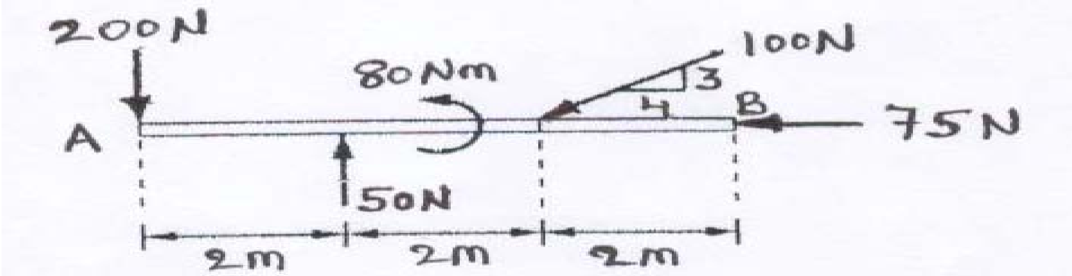
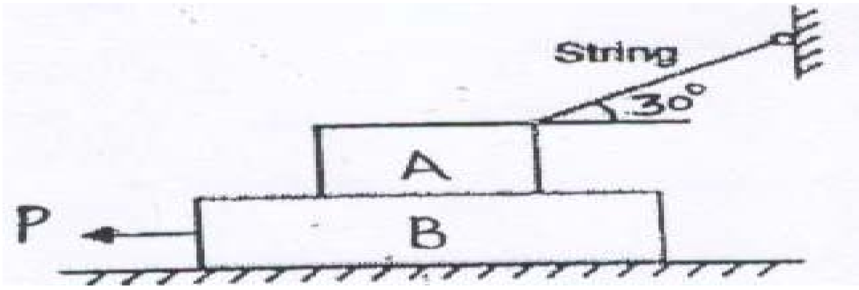
3 Replace the system of forces and couple as shown in figure below, by a single force couple system at A.



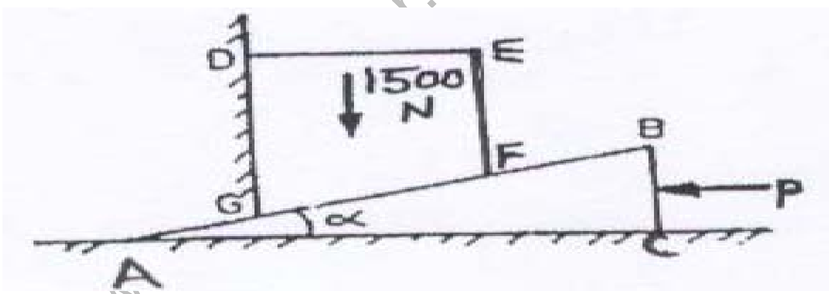
UNIT – II

4 Two blocks A and B of weights 1 kN and 2 kN, respectively are in equilibrium position as shown in figure below. If coefficient of friction between the two blocks as well as the block B and the floor is 0.3, find the force P required to move the block B. Also find the force in the string.



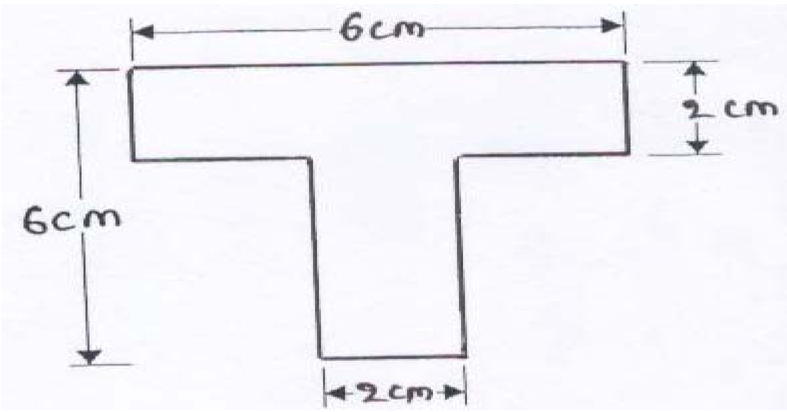
OR

5 A block placed over a 100 wedge on a horizontal floor and leaning against a vertical wall as shown in figure below and weighing 1500 N is to be raised by applying a horizontal force to the wedge. Assuming co-efficient of friction between all the surfaces in contact to be 0.3, determine the minimum horizontal force to be applied to raise the block.



UNIT – III

6 Calculate the moment of inertia about horizontal and vertical axes (I_{xx} and I_{yy}) of the section show in figure below.



OR

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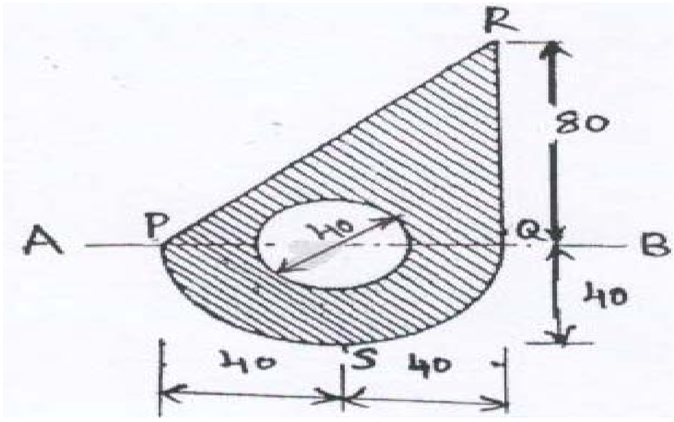
7 Find the moment of inertia of the shaded area shown in the figure below about the axis AB.

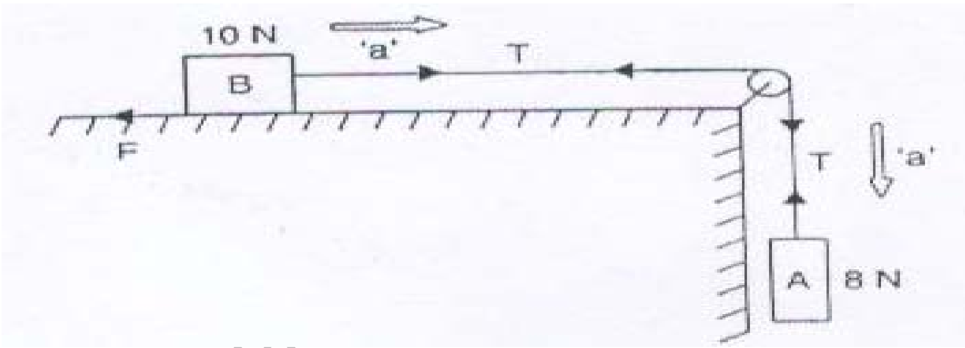


UNIT – IV

8 A car starts from rest and accelerates uniformly to a speed of 80 km/hour over a distance of 500 meters, calculate the acceleration and time taken. If a further acceleration raises the speed to 96 km/hour in 10 seconds, find the acceleration and further distance moved. The brakes are now applied and the car comes to rest under uniform retardation in 5 seconds. Find the distance travelled during braking.

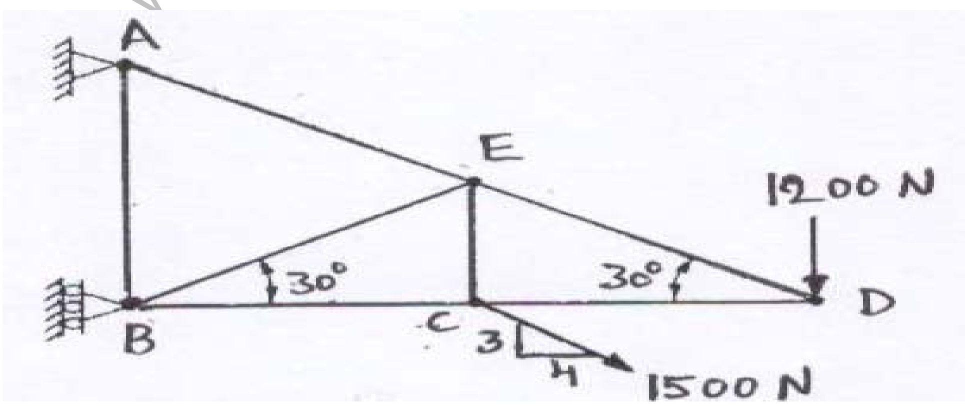
OR

9 Two blocks shown in figure below, have weight A = 8N and B = 10N and coefficient of friction between the block A and horizontal plane, μ = 0.2. If the system is released, from rest and the block A falls through a vertical distance of 1.5 m, what is the velocity acquired by it? Neglect the friction in the pulley and extension of the string.



UNIT – V

10 Determine the forces in all the members of the frames shown in figure below. Indicate the nature of the forces also.



OR

11 A particle is in simple harmonic motion. Its maximum velocity was 6 m/sec and the maximum acceleration was found to be 12 m/sec^2. Determine its angular velocity, amplitude. Also determine its velocity and acceleration when displacement is half the amplitude.

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