B. E. First Semester (All)/Second (Group B)/SoE – 2014-15 Examination

Course Code : CV 1101/CV 101 **Course Name : Engineering Mechanics**

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) All questions are compulsory.
(2) All questions carry marks as indicated.
(3) Assume suitable data wherever necessary.
(4) Illustrate your answers wherever necessary with the help of neat sketches.
(5) Use of non programmable calculator, Drawing instruments is permitted.

1. Solve any **One** :

(a) Define force. Explain the characteristics of force. The four coplanar forces are acting at a point as shown in Figure 1. Determine the resultant in magnitude and direction.

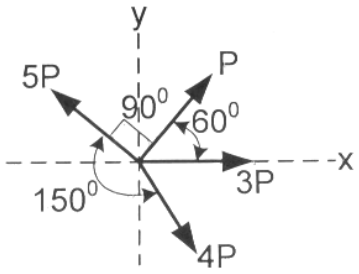

Figure 1

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(b) For the given forces shown in figure 2, calculate the resultant and its X and Y intercept with respect to point 'O'. Size of block is 1 cm x 1 cm.

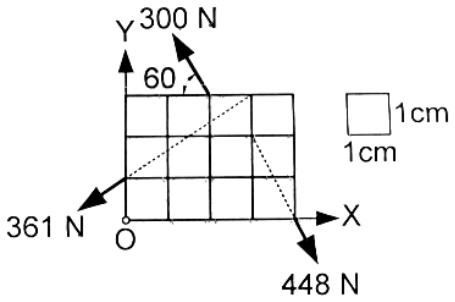

Figure 2

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2. Solve any **One** :

(a) Two identical cylinders of weight W and radius r are placed in a rectangular channel of width 3.5 r as shown in Figure 3, determine the reaction at contact points A, B, C and D. Assume all the contact surfaces as smooth.

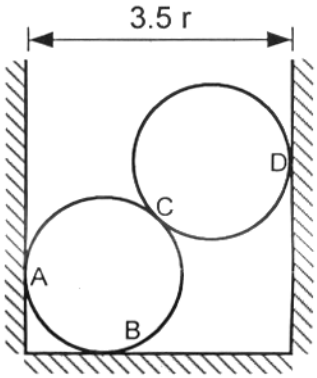

Figure 3

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(b) Two rigid rods BA and CA are joined together at point A as shown in the figure 4. A force of 1000 N is placed at point A. Find the forces in the rod BA and CA.

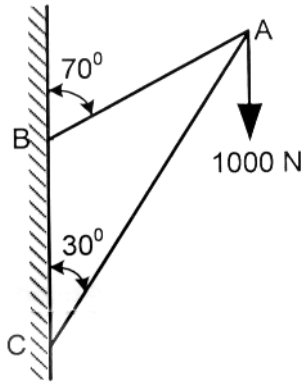

Figure 4

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3. Solve any **One** :

(a) A 400 N block is resting on a rough horizontal surface for which the coefficient of friction is 0.4. Determine the force P required to cause motion to impend if applied to the block

(a) Horizontally or

(b) Downward of 30^0 with the horizontal

(c) What minimum force is required to start motion ? 7

(b) Analyze the truss shown in Figure 5 by method of joint and write the result in tabular form.

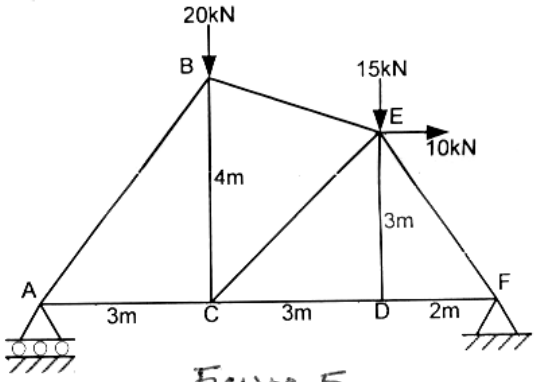

Figure 5

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4. Solve any **One** :

(a) For the shaded area shown in figure 6, calculate the centroids with respect to given axis.

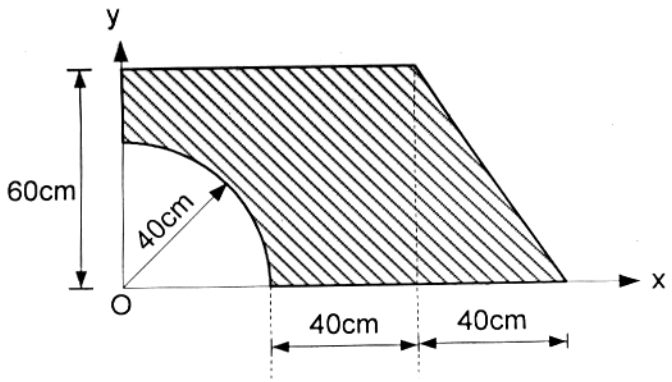

Figure 6

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(b) Calculate Moment of inertia of the shaded area shown in Figure 7 with respect to given axes.

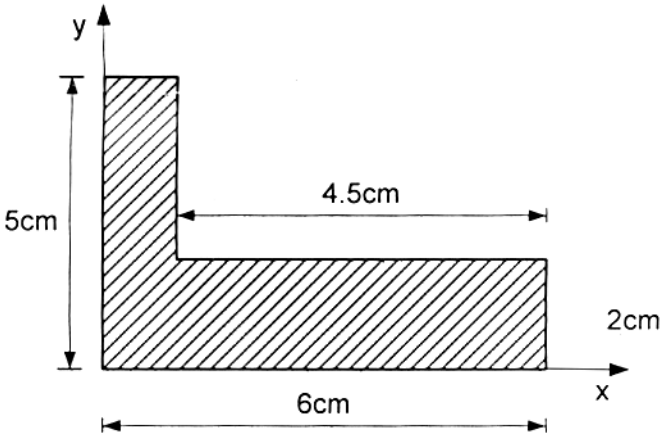

Figure 7

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5. Solve any **Two** :

(a) Determine the acceleration of Block A and B as shown in Figure 8. The system is released from rest. Block A weight 300 N and block B weight 400 N. Assume the surfaces are smooth.

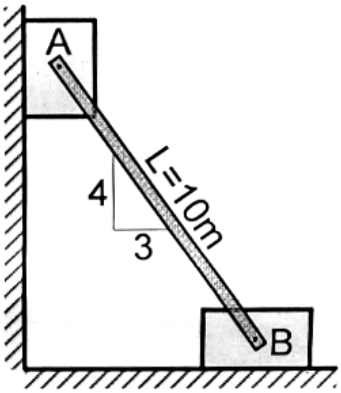

Figure 8

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(b) The double pendulums shown in Figure 9 consist of two links AB and BC are pinned together. These links are held in position by horizontal force

P. If link AB is twice as long and heavy as link BC, find the equilibrium position as defined by the angles θ, ϕ.

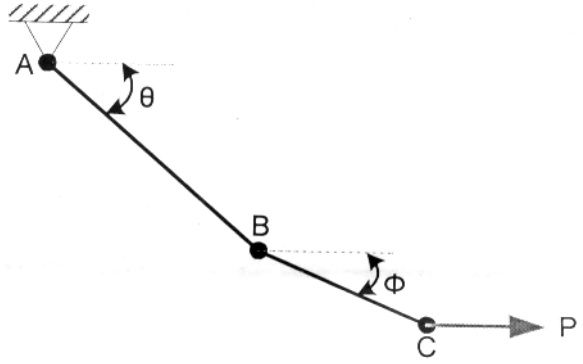

Figure 9 7.5

(c) Using Virtual Work method determine reaction at supports A, B and D for the beam shown in Figure 10. Point C is the internal hinge in the given beam.

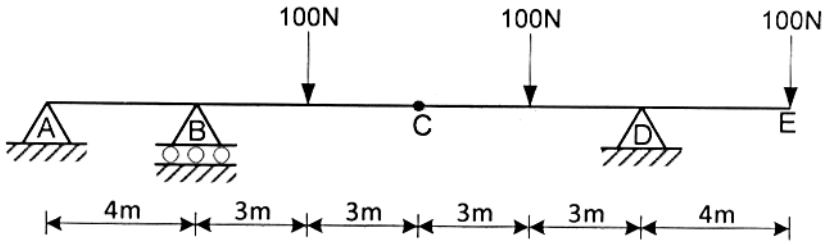

Figure 10 7.5

6. Solve any **Two** :

(a) Two bodies A and B weighing 200 N and 300 N respectively approach each other with velocity 4 m/s and 2 m/s respectively. If the coefficient of restitution is 0.6
Find,

(i) The velocities of bodies A and B just after impact,

(ii) Loss of energy during impact and,

(iii) If the impact lasts for 0.01 sec, find average impact force. 7.5

(b) The balls A and B are attached to stiff rods of negligible weight as shown in Figure 11. Ball A is released from rest and allowed to strike B. if coefficient of restitution is 0.65,
Determine,

(i) The maximum angle theta (θ) through which ball B will swing after impact,

(ii) The maximum and minimum tension in the rod attached to B and,

(iii) The average impact force, if the impact lasts for 0.01 sec.

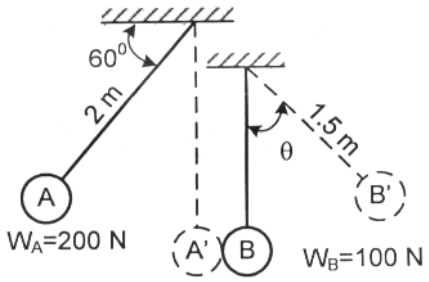

Figure 11

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(c) A Bullet 'A' of mass 0.01 kg moving with a velocity of 100 m/s hits a bob 'B' of simple pendulum of mass 1 kg horizontally as shown in figure 12. Find the maximum angle through which pendulum swings after impact when,

(i) Bullet gets embedded in bob,

(ii) Bullet rebound from the surface of bob with a velocity of 20 m/s and,

(iii) Bullet escape from the other end of the bob with a velocity of 20 m/s.

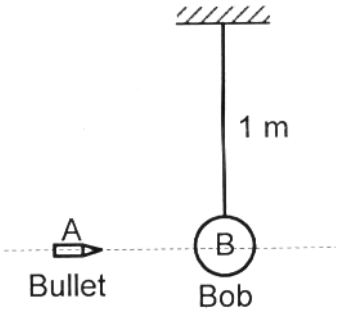

Figure 12

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