Code.No: 09A1BS05 | R09 | SET-1

I B.TECH – EXAMINATIONS, JUNE - 2011
ENGINEERING MECHANICS
(COMMON TO CE, ME, CHEM, MCT, MMT, AE, AME, MIE, MIM)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE questions
All questions carry equal marks

- - -

1.a) What do you mean by coplanar concurrent force system? Explain with suitable example.

b) If the X component is as shown in figure 1 of P is 893 N, determine P and its Y component. [5+10]

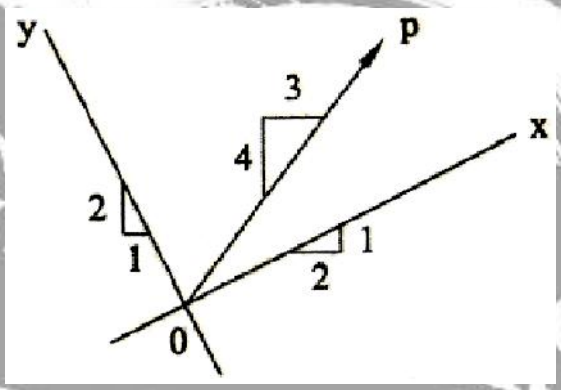

Fig: 1

2. Determine tension in cable and horizontal and vertical component of reactions at pin A. The pulley P is frictionless as shown in figure 2. [15]

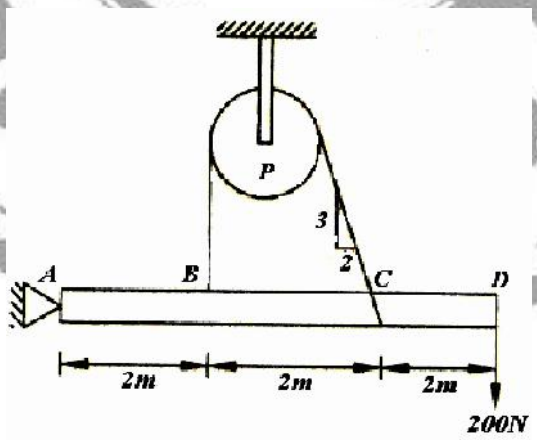

Fig: 2

3.a) Find the centroid of the plane lamina shown in figure 3a.

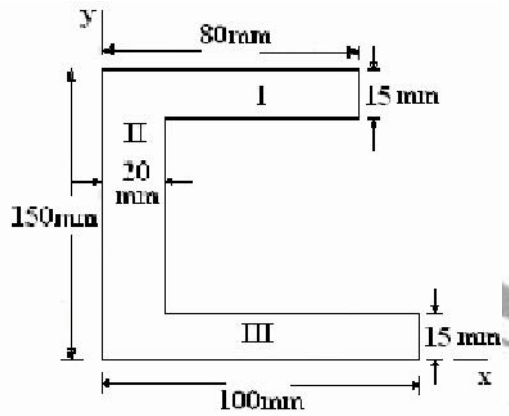

Fig: 3a

b) Find the centroid of the plane lamina shown in figure 3b. [7+8]

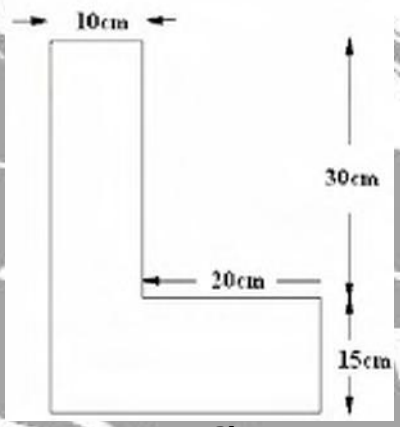

Fig: 3b

4. Find the moment of inertia of thin plates about AA - axis shown in the figure 4. Assume a thickness of 8 mm. [15]

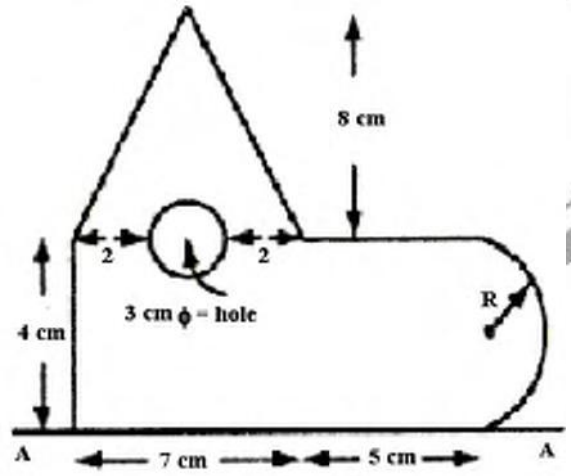

Fig: 4

5. Find the forces in all the members of the truss shown in the figure 5 (All forces are in kN) [15]

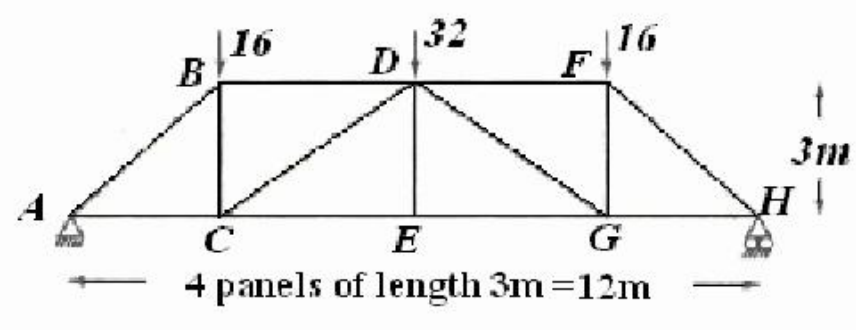

Fig: 5

6. The angular acceleration of a fly wheel is given by $\alpha = 8 - t$, where α is inradians S^2 and t is in seconds. If the angular velocity of the flywheel is 42 rad/s at end of 6 seconds, determine initial angular velocity and the number of revolutions made during the 6 seconds. [15]

7. Two bodies of weight W_A = 800N and W_B = 400N are connected to the two ends of light inextensible string, passing over smooth pulley. The weight W_A is placed on rough horizontal surface whose coefficient of friction is 0.25 and W_B is hanging vertically in air. If the system is released from rest and block 'B' falls through a vertical distance of 2.0m, determine the velocity attained by 'B'. [15]

8.a) Determine reaction at supports as shown in figure 6a using the principle of virtual work.

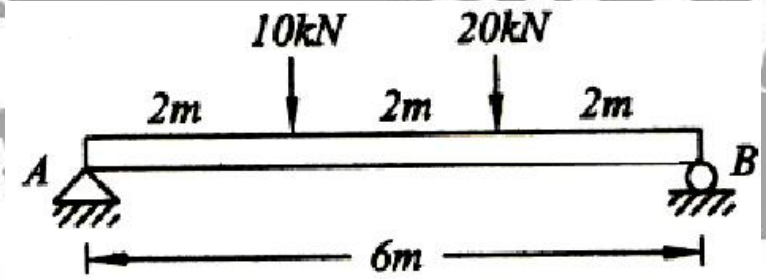

Fig: 6a

b) Determine reaction at supports as shown in figure 6b using the principle of virtual work. [7+8]

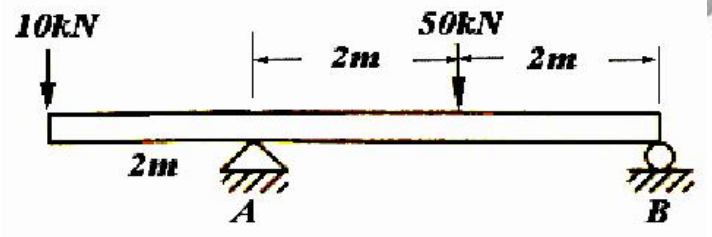

Fig: 6b

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I B.TECH – EXAMINATIONS, JUNE - 2011
ENGINEERING MECHANICS
(COMMON TO CE, ME, CHEM, MCT, MMT, AE, AME, MIE, MIM)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE questions
All questions carry equal marks

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1.a) What is a couple? Explain with neat diagram.
b) Determine the resultant of the four forces and one couple that act on the plate as shown in the figure 1. [5+10]

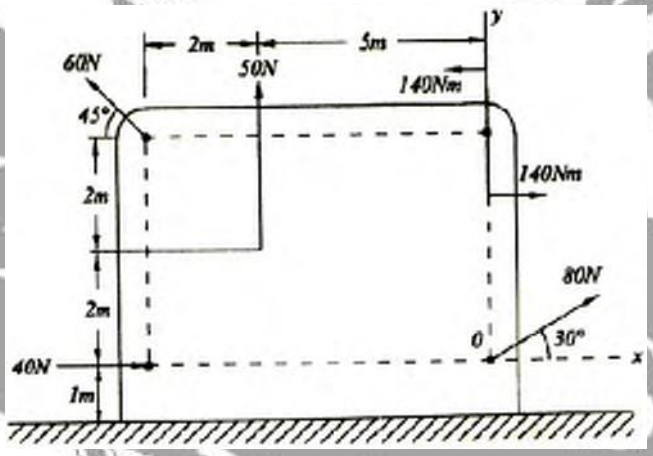

Fig: 1

2. Three bars lying in one plane hinged at their ends are shown in figure 2. They are subjected to force P and Q applied at B and C. If P = 100 N, determine the value of force a necessary to keep the system of bars in equilibrium. [15]

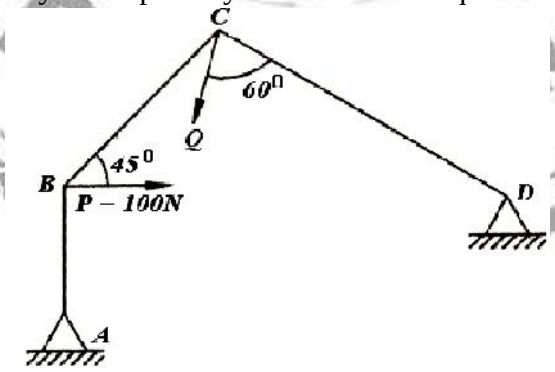

Fig: 2

3. Determine the volume and surface area of the solid shown in the figure 3. [15]

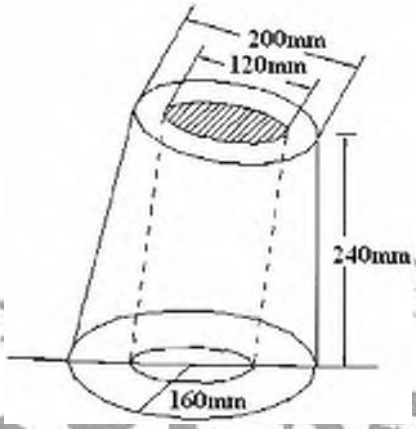

Fig: 3

4. Locate the centroid and calculate moment of inertia about horizontal and vertical axis through the centroid as shown in figure 4. (All dimensions are in cm). [15]

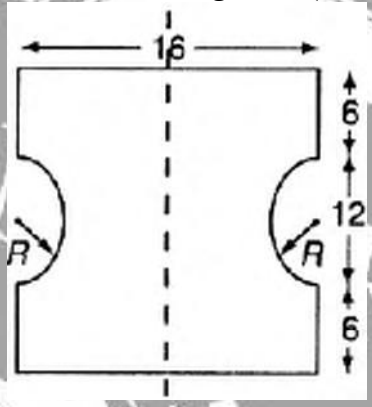

Fig: 4

5. Find the forces in all the members of the truss shown in the figure 5 (All forces are in kN). [15]

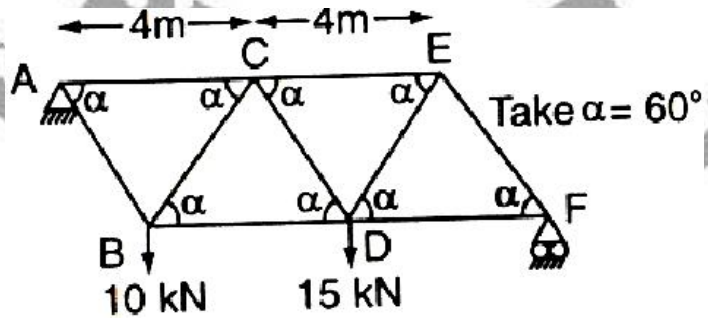

Fig: 5

6. The rotation of a fly wheel is governed by the relation $\alpha = 10t - t^2$ where α is in radians/s^2 and t is in seconds. How many revolutions will the flywheel make, starting from rest, before it momentarily stops prior to reversing its direction? [15]

7. A Block of weight 20 N falls at a distance of 0.75 m on top of the spring. Determine the spring constant if it is compressed by 150mm to bring the weight momentarily to rest. [15]

8. Determine reaction at supports as shown in figure 6 using the principle of virtual work. [15]

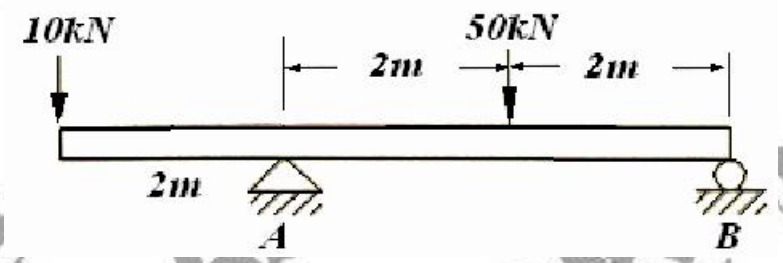

Fig: 6

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I B.TECH – EXAMINATIONS, JUNE - 2011
ENGINEERING MECHANICS
(COMMON TO CE, ME, CHEM, MCT, MMT, AE, AME, MIE, MIM)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE questions
All questions carry equal marks

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1.a) The hook shown in figure 1a is connected to three cables. What is the resultant force on the hook?

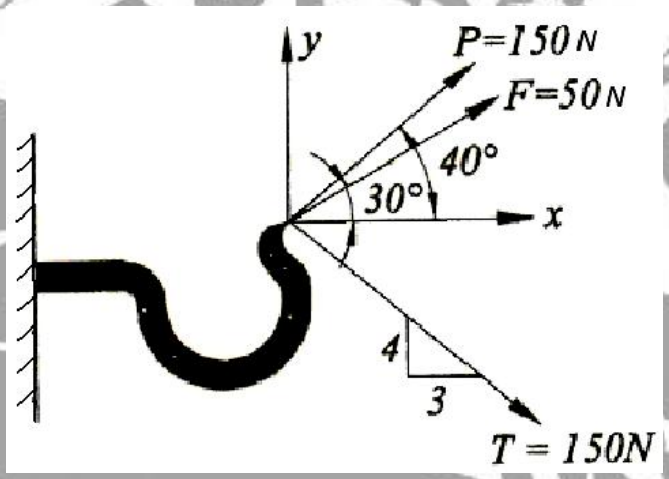

Fig: 1a

b) A body is subjected to a force F as shown in figure 1b. If x component of force is 600 N, find the component perpendicular to the plane. [7+8]

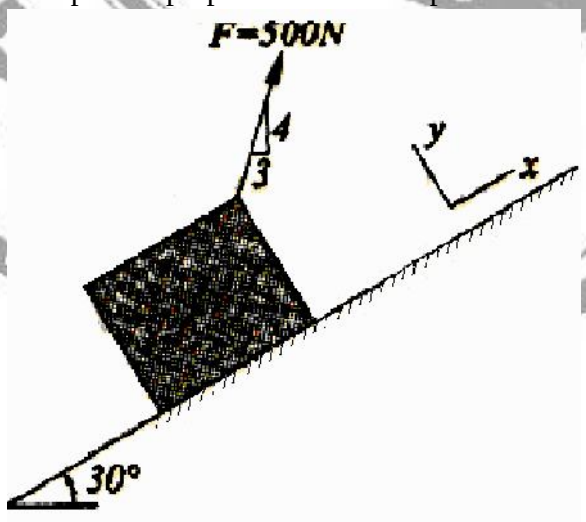

Fig:1b

2.a) Write the equilibrium equations for a body in space.

b) A vertical mast CE in supported in a ball and socket joint at C by cables BD and AE as shown in figure 2. A pull P $\left(=400\bar{i}+300\bar{k}\right)N$ acts at top of the mast. Find components of reaction at C. [3+12]

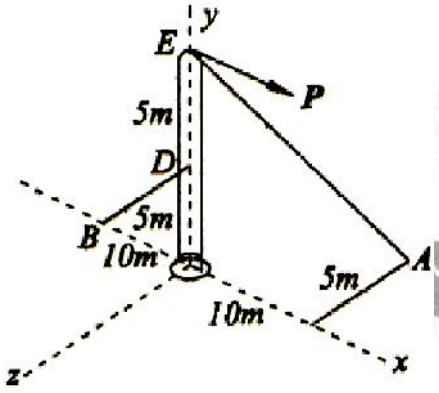

Fig: 2

3. Locate the centroid of a shaded area as shown in the below figure 3. [15]

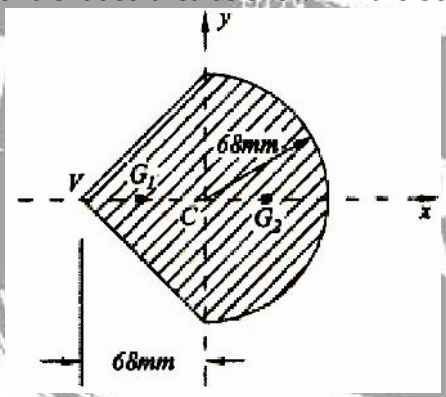

Fig: 3

4. Locate the centroid and calculate moment of inertia about horizontal and vertical axis through the centroid as shown in figure 4. (All dimensions are in cm). [15]

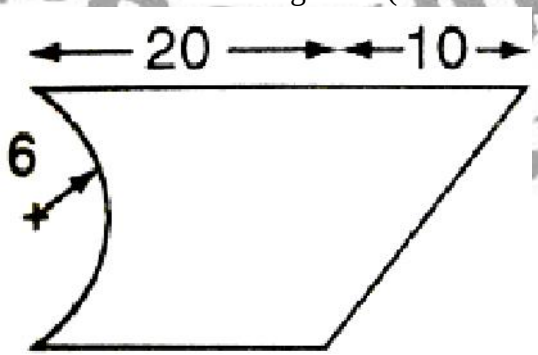

Fig: 4

5. Find the forces in all the members of the truss shown in the figure 5 (All forces are in kN). [15]

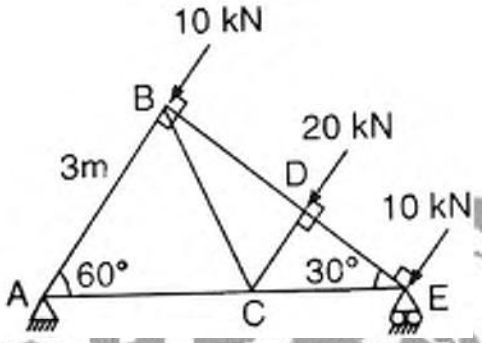

Fig: 5

6. Given angular velocity $\omega = 4 rad/s$ c.w and angular acceleration $\alpha = 8 rad/s^2$, determine horizontal and vertical component of acceleration of point B located on rim of pulley as shown in figure 6. [15]

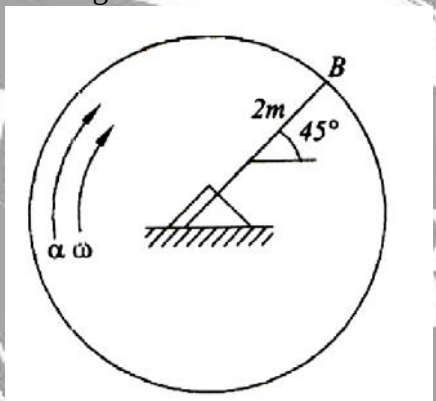

Fig: 6

7. A 60N block is released form rest on an inclined plane which is making an angle of 30^0 to the horizontal. The block starts from 'A', slides down a distance of 1.2m and strikes a spring with a stiffness of 8kN/m. The coefficient of friction between the inclined plane and the block is 0.25. Determine:
   a) The amount the spring gets compressed and
   b) Distance the block will rebound up the plane from the compressed position.
   [15]

8. Determine reaction of the given overhanging beam using the principle of virtual work as shown in figure 7. [15]

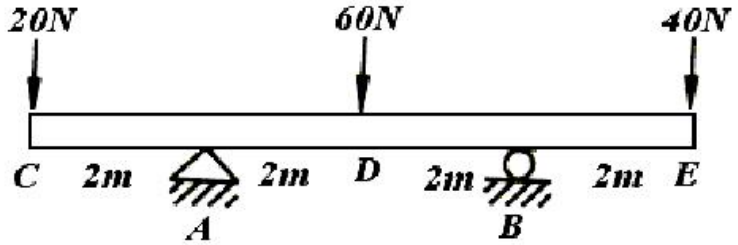

Fig: 7

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I B.TECH – EXAMINATIONS, JUNE - 2011
ENGINEERING MECHANICS
(COMMON TO CE, ME, CHEM, MCT, MMT, AE, AME, MIE, MIM)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE questions
All questions carry equal marks

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1.a) What is Lamis theorem? Explain for a simple case.
b) Find resultant of given system of forces as shown in figure 1. [5+10]

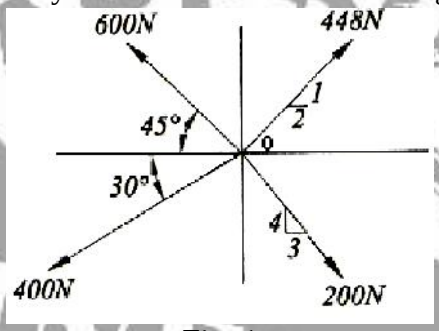

Fig: 1

2. A load of 60kN is to be resisted by means of a shear leg arrangement as shown in figure 2. Determine forces in legs AB, AC and rope AD. [15]

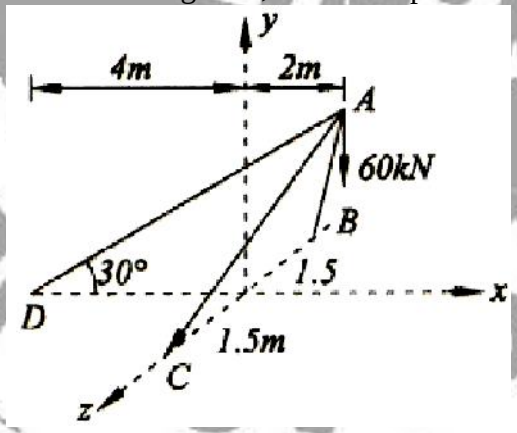

Fig: 2

3.a) State and prove second theorem of pappus.
b) What are the applications of theorems of pappus?
c) Under what situation centre of gravity is coincident with centroid of volume. [15]

4. Locate the centroid and calculate moment of inertia about horizontal and vertical axis through the centroid as shown in figure 3 (All dimensions are in cm). [15]

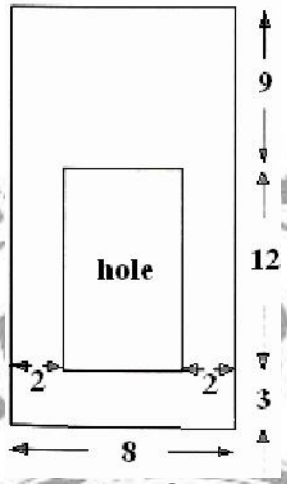

Fig: 3

5. Find the forces in all the members of the truss shown in the figure 4 (All forces are in kN). [15]

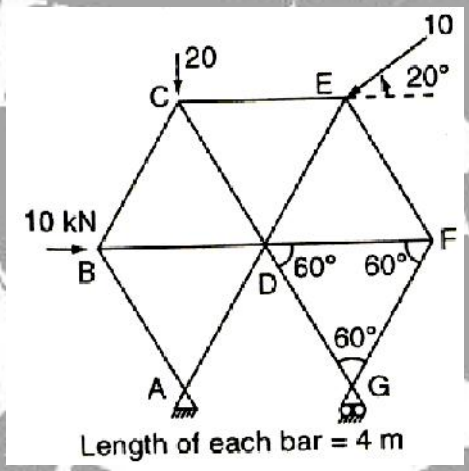

Fig: 4

6. The step pulley shown in figure 5 starts from rest and accelerates at 2rad/s^2. What time is required for block A to move 20m? Find also the velocity of A and B at that time. [15]

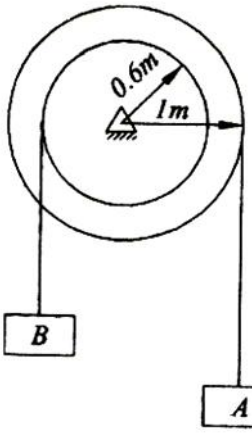

Fig: 5

7. Two rough planes inclined at 30^0 and 60^0 to the horizontal and of the same height are placed back to back. Masses of 12 kg and 30 kg are placed on the faces and connected by a string passing over the top of the planes. If $\mu = 0.6$ find the velocity of the blocks when they travel a distance of 10m, starting from rest. [15]

8. Referring to the figure 6, what is the virtual work is θ_1 is fixed and θ_2 varies by $\delta\theta_2$? [15]

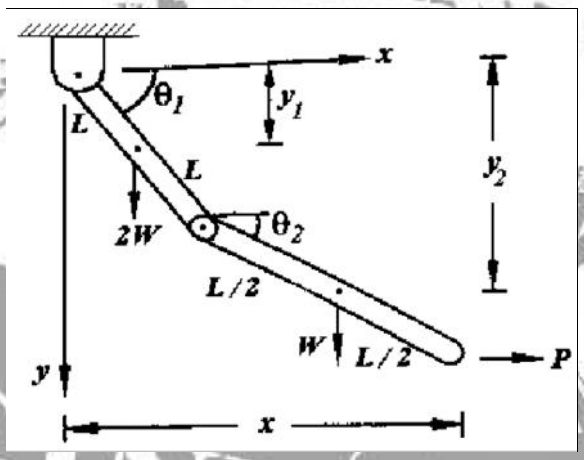

Fig: 6

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