(Please write your Exam Roll No.) Exam Roll No. ....

END TERM EXAMINATION

SECOND SEMESTER [B.TECH] APRIL – MAY 2019

Paper Code: ETME-110 **Subject: Engineering Mechanics**

(Batch-2013 Onwards)

Time : 3 Hours **Maximum Marks :75**

Note: Attempt five questions in all including question no.1 which is compulsory. Select one question from each unit.

Q1 Attempt each one of the following:- (2.5x10=25)

(a) State principle of transmissibility of force.
(b) What is meant by equilibrant?
(c) State and prove Lami's theorem.
(d) Derive the equation for the centroid of quarter circle.
(e) Distinguish between simply supported truss and cantilever truss.
(f) What is the use of wedge?
(g) Distinguish between rectilinear motion and curvilinear motion.
(h) Explain the behavior of a rolling body.
(i) What is impulsive force?
(j) What is the relation between shear force and bending moment?

UNIT-I

Q2 Three cylinders are piled up in a rectangular channel as shown in Fig 1. Determine the reactions at point 6 between the cylinder A and the vertical wall of the channel. (12.5)

(a) Cylinder A : radius = 4 m, m = 15 kg
(b) Cylinder B : radius = 6 m, m = 40 kg
(c) Cylinder C : radius = 5 m, m = 20 kg

Q3 Derive the relation $T1/T2 = e^{\mu\theta}$. (12.5)

UNIT-II

Q4 For the truss shown in Fig 2, calculate the force in members BD, BE and CE by the method of section only. (12.5)

Q5 Fig. 4 shows a plane area. Find the M. I. of the section about x-x and y-y axis passing through the C.G. of the section. (12.5)

UNIT-III

Q6 Derive the expression for coefficient of restitution. (12.5)

Q7 The crank BC of a slider crank mechanism is rotating at constant speed of 30 rpm as shown in Fig. 5 clockwise. Determine the velocity of the cross head A at the given instant. (12.5)

UNIT-IV

Q8 Draw the shear force diagram and bending moment diagram for the beam loaded as shown in Fig 3. (12.5)

Q9 Determine the minimum weight of block required to keep the beam in horizontal equilibrium as shown in Fig 6. Assume rough pulley with coefficient of friction as 0.2. (12.5)

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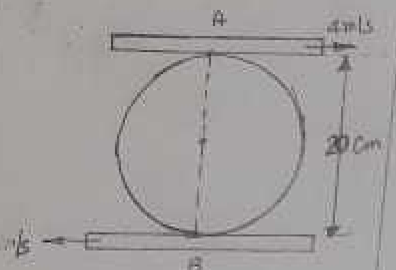

Fig 8(a)

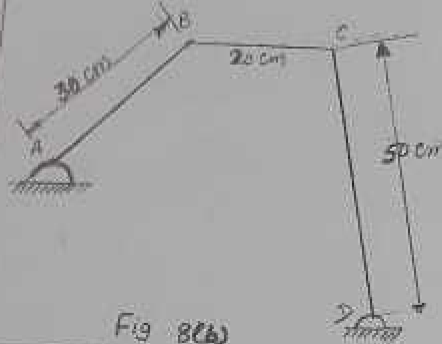

Fig 8(b)

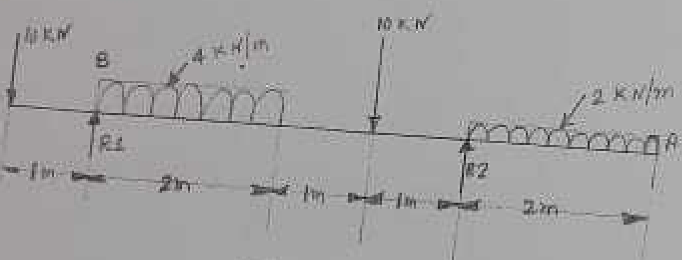

Fig 9(b)

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END TERM EXAMINATION

SECOND SEMESTER [B.TECH] MAY-JUNE-2018

Paper Code: ETME-110 **Subject: Engineering Mechanics**
[BATCH 2013 ONWARDS]

Time: 3 Hours **Maximum Marks: 75**

Note: Attempt five questions in all including Q.No1 which is compulsory. Select one question from each unit. Assume suitable missing data if any.

Q1 Short questions:- **(2.5x10=25)**
- (a) Define resultant and equilibrant.
- (b) What is a couple? What are its properties?
- (c) Why co-efficient of dynamic friction is less than that of static friction?
- (d) Explain the principle involved in graphical method in the analysis of trusses.
- (e) Define moment of inertia of an area. Why it is called the second moment of area?
- (f) What is meant by dependent motion? Give example.
- (g) State D' Alembert's principle. Why it is called principle of dynamic equilibrium?
- (h) How will you locate the instantaneous centre of rotation?
- (i) Explain centre of percussion.
- (j) Define the term shear force and bending moment at the cross-section of a beam.

UNIT-I

Q2 (a) A bracket is subjected to a force as shown in fig 2(a). Find an equivalent force couple at A. **(6.5)**

(b) Find the reactions at the supports A and C of the bent shown in fig 2 (b). **(6)**

Q3 (a) What is a screw jack? Explain the principle on which it works. **(3.5)**

(b) A rectangular prism weighing 150 N is lying on an inclined plane whose inclination with the horizontal is shown in fig 3 (b). The block is tied by a horizontal string which has a tension of 50 N. Using first principles, find (i) the frictional force on the block (ii) the normal reaction at the inclined plane (iii) the co-efficient of friction between the surfaces of contact. **(9)**

UNIT-II

Q4 (a) Explain the principles involved in (i) method of joints (ii) method of sections in the analysis of trusses. **(4)**

(b) For the simply supported truss shown in fig 4(b), find the forces in the members BD, DE and EG. **(8.5)**

Q5 (a) Drive from first principles, the centroid of a cone. **(6)**

(b) A rectangular hole is made in a triangular area as shown in fig 5 (b). Find the M.O.I of the shaded area about the centroidal horizontal and vertical axes. Width of the hole is 20 cm. **(6.5)**

UNIT-III

Q6 (a) A stone is dropped from the top of a building. It was found that during the last one second of its journey, it has covered one-seventh of the height of the building. Find the height of the building. **(6)**

(b) A car enters a curve of 200 m radius at a speed of 45 kmph. If the car increases its speed at a rate of $2 m/s^2$, what will be its total acceleration when the car has travelled 450 m along the curve. **(6.5)**

Q7 (a) Explain work of a force. **(4)**

(b) State and explain the law of conservation of linear momentum. **(4)**

(c) Prove that the two elastic bodies of equal masses exchange velocities in the case of direct central impact. **(4.5)**

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UNIT-IV

Q8 (a) A roller of radius 10 cm rides between two horizontal bars moving in the opposite directions as shown in fig 8 (a). Assuming no slip at the point of contacts A and B, locate the instantaneous centre of the roller. Where will be the instantaneous centre when both the bars are moving in the same direction? **(4)**

(b) In the mechanism shown in 8(b), AB rotates clockwise with an angular velocity of 10 rad/sec. Find the angular velocities of bars BC and CD, when the bar AB makes an angle of 30^0 with the horizontal, bar CD makes an angle of 60^0 and the bar BC is horizontal. **(8.5)**

Q9 (a) A uniform bar of mass m and length l hangs from a frictionless hinge. It is released from rest from the horizontal position. Find the angular and linear velocity of its mass centre when it is in vertical position. **(4)**

(b) Draw the SF and BM diagrams for the beam loaded as shown in fig 9(b). also locate the points of contra flexure. **(8.5)**

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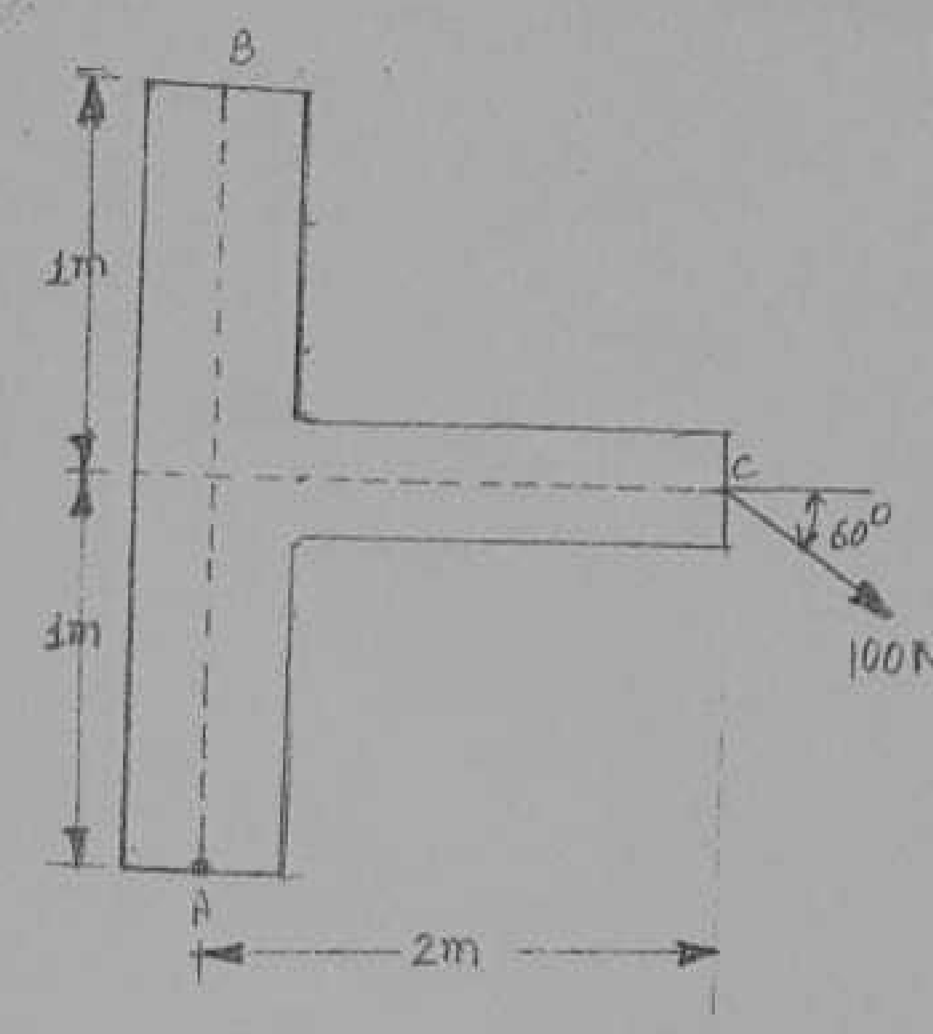

Fig 2(a)

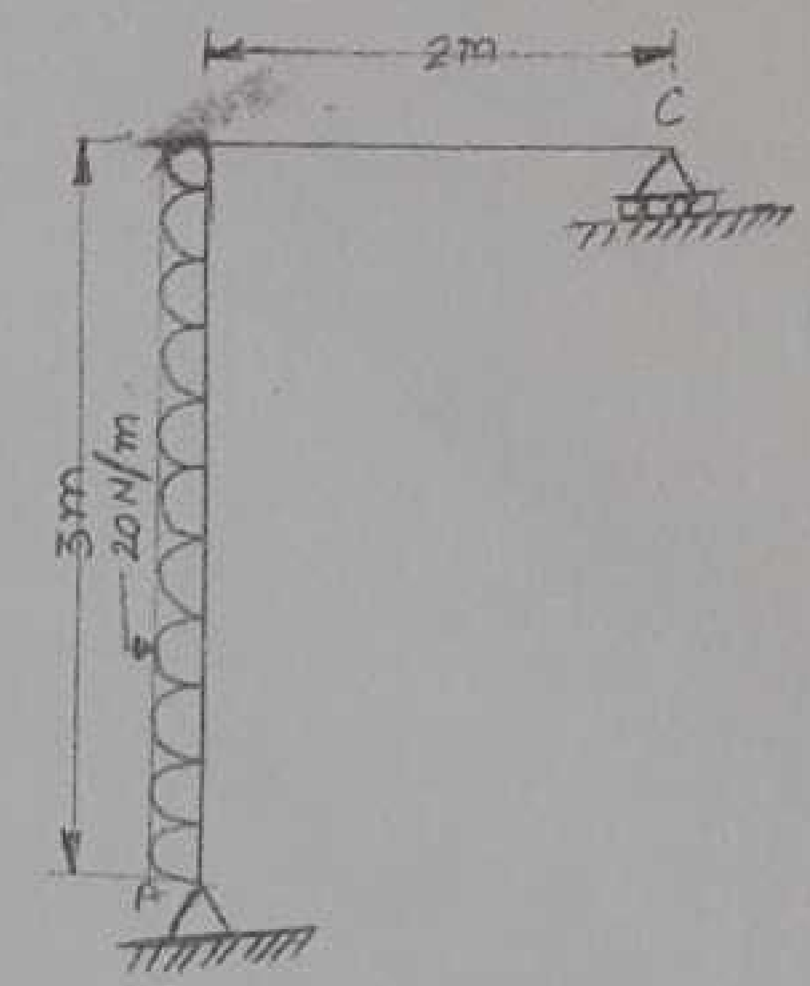

Fig 2(b)

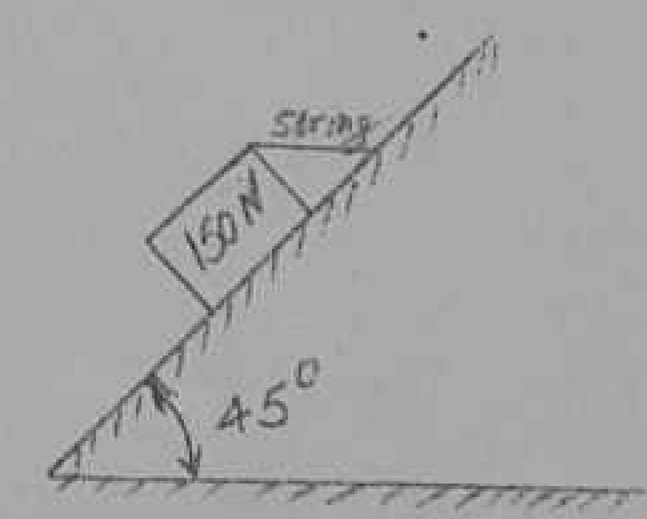

Fig 3(b).

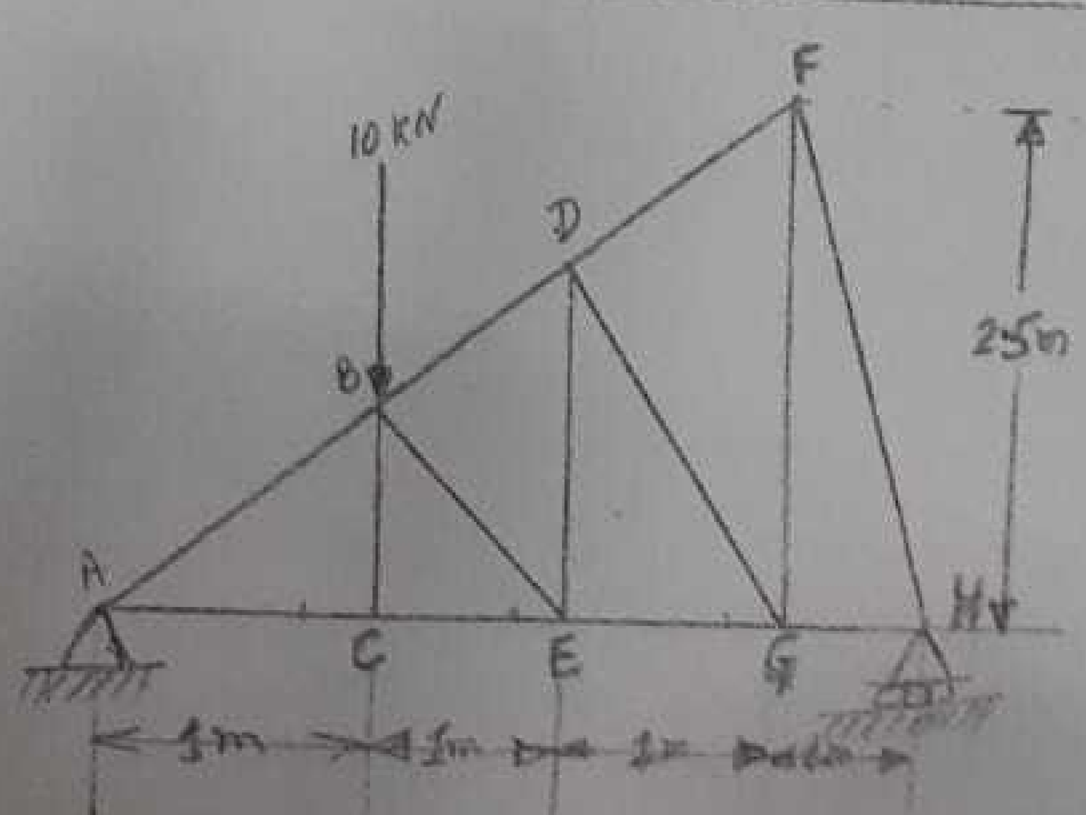

Fig 4(

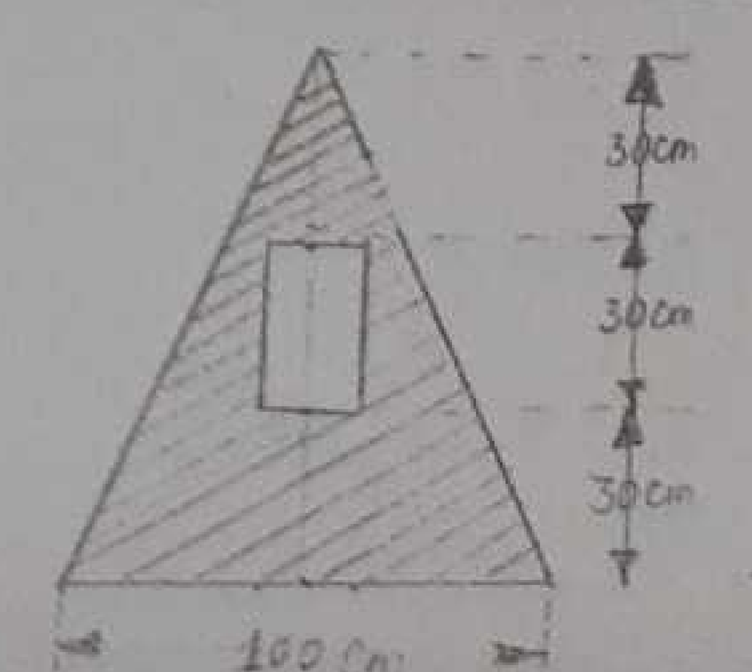

Fig 5(b)

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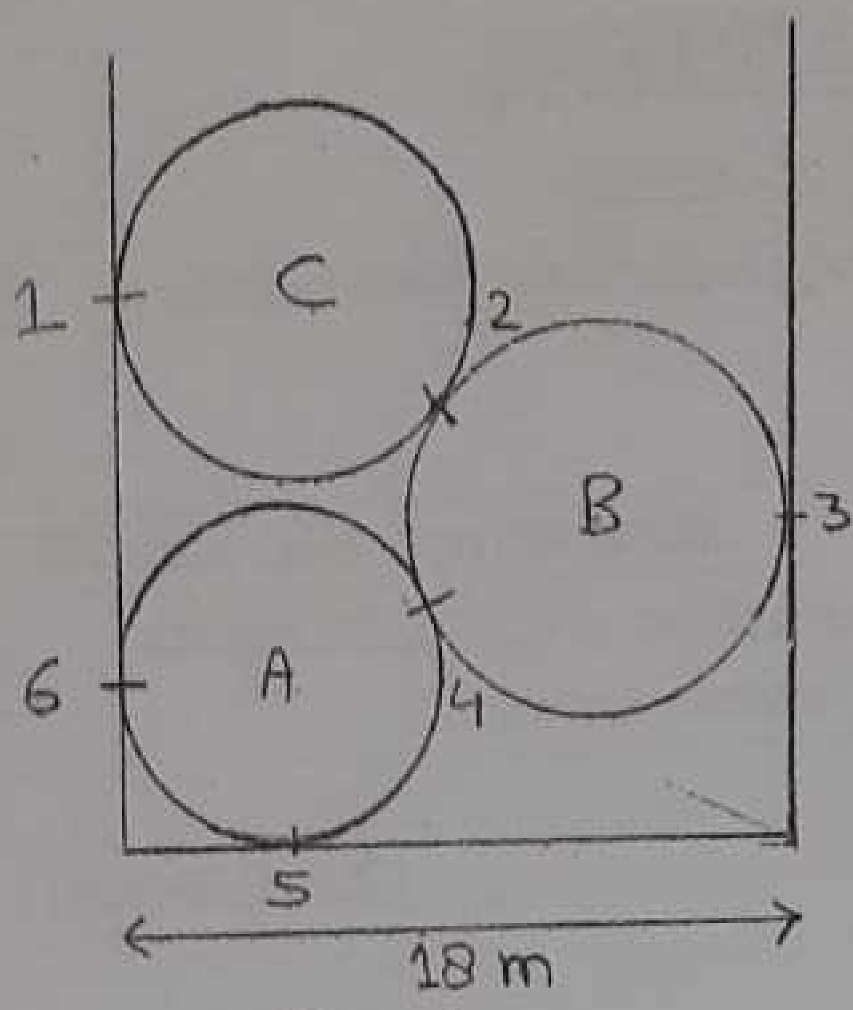


FIG. 1

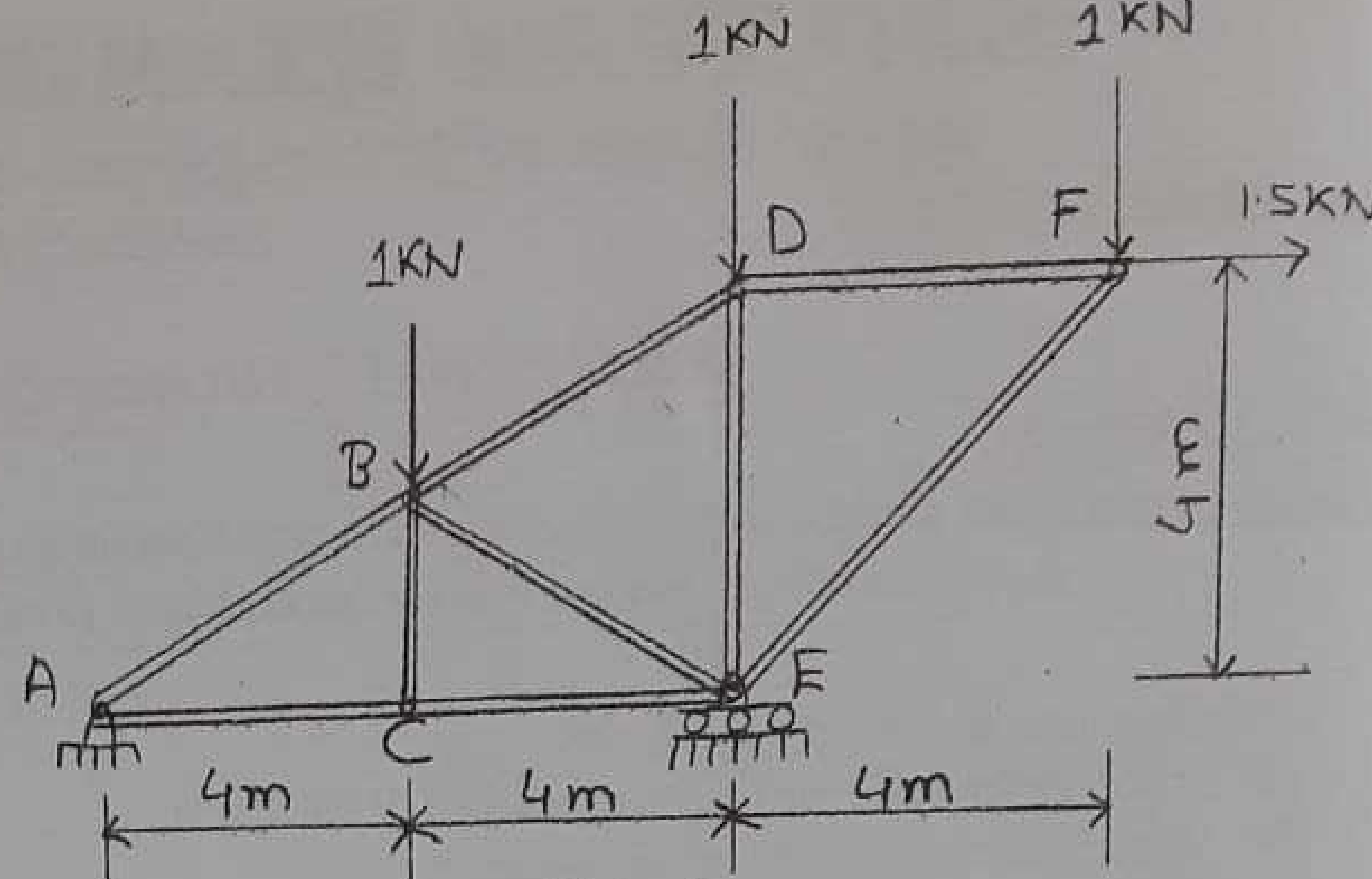


FIG. 2

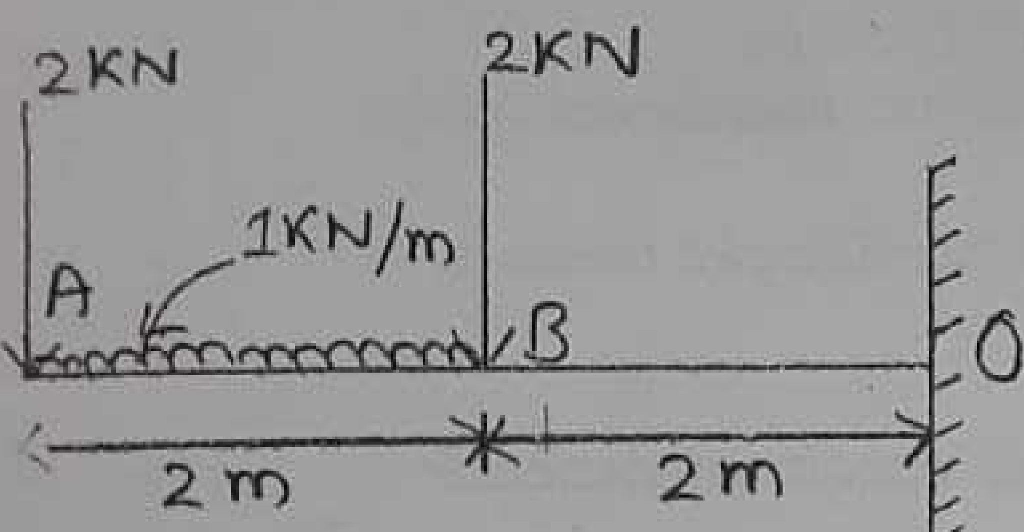


FIG. 3

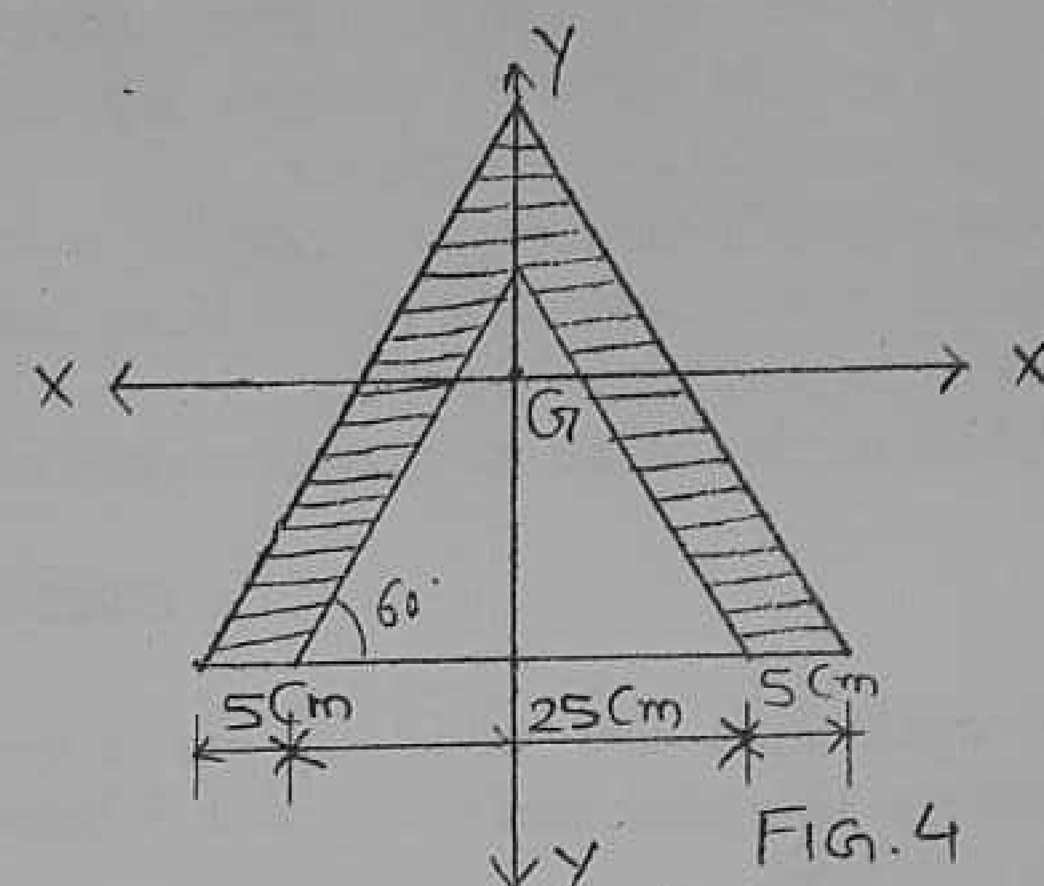


FIG. 4

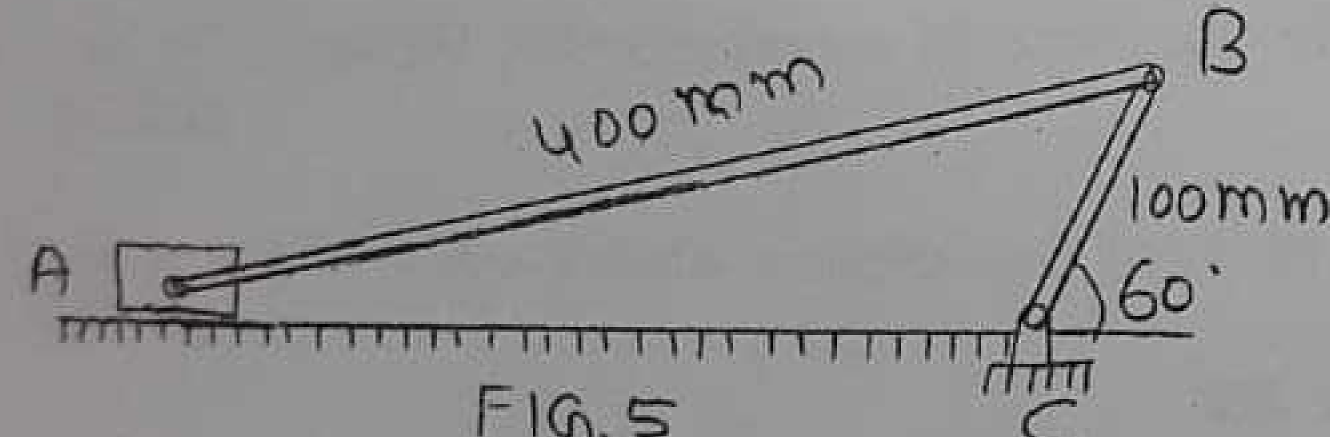
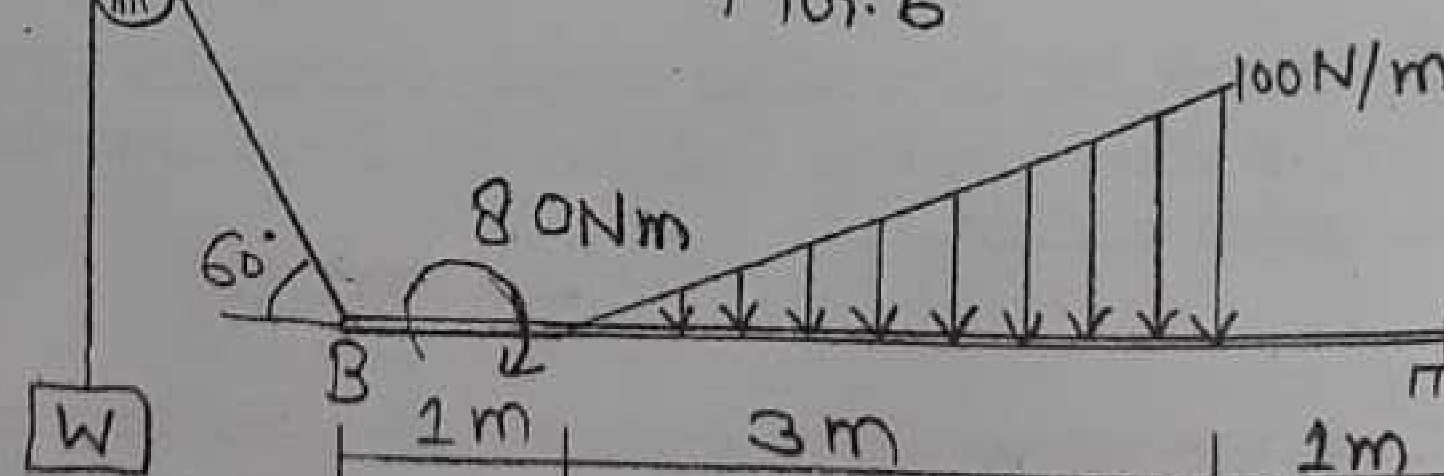


FIG. 5

FIG. 6



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