

**SEM 1 – 3 (RC 07-08)**

**F.E. (Sem – I) (Revised in 2007-08) Examination, May/June 2015**  
**BASIC CIVIL ENGINEERING AND ENGINEERING MECHANICS**

Duration : 3 Hours

Total Marks : 100

- Instructions :**
- 1) Attempt totally **five** questions with at least **one** question from **each Module**.
  - 2) Make suitable assumptions if necessary and state them clearly.

**MODULE – I**

1. a) Explain the importance of the following in civil engineering :
  - i) Environmental Engineering
  - ii) Structural Engineering. (5+5)
- b) Write short notes on :
  - i) Types of steel sections used in construction.
  - ii) Curing of concrete. (5+5)
2. a) Explain general classification of roads. Briefly mention about the components of roads and their functions. 10
- b) Write short notes on :
  - i) Self contracting concrete
  - ii) Grades of concrete. (6+4)



## MODULE – II

3. a) Determine the magnitudes of the loads  $W_1$  and  $W_2$  such that the part of the string BC remains horizontal in the equilibrium condition. Also find out tensions in the portion AB, BC and CD of the string.

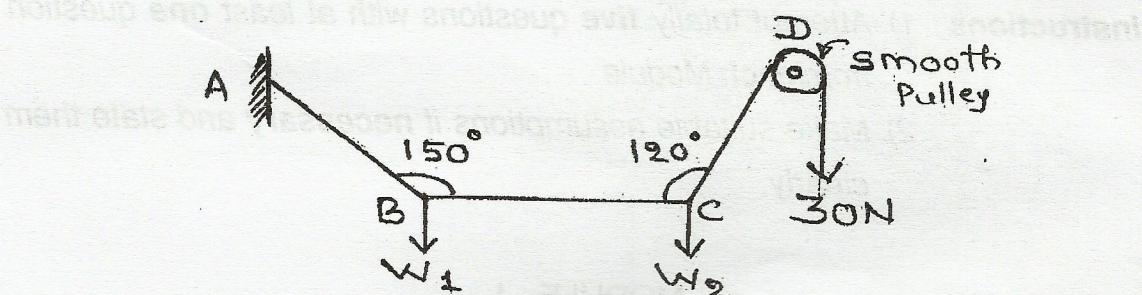


Fig. No. 3(a)

- b) Determine the resultant of the given force system. Locate the position of the resultant with respect to point A.

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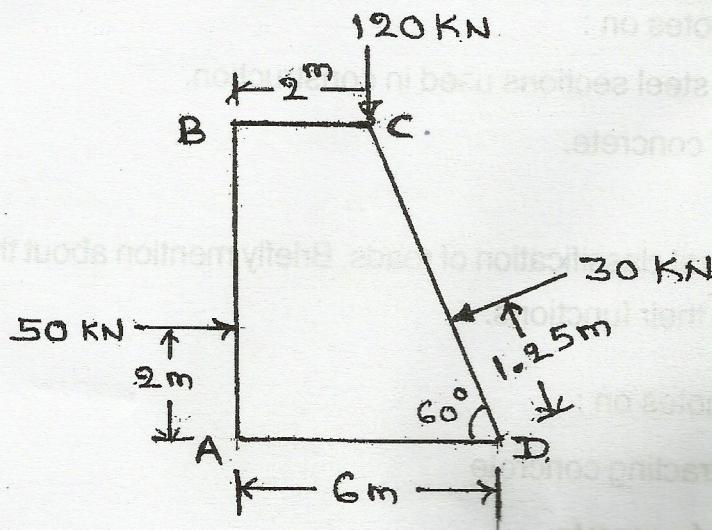


Fig. No. 3(b)

4. a) Determine the support reactions for the beam shown.

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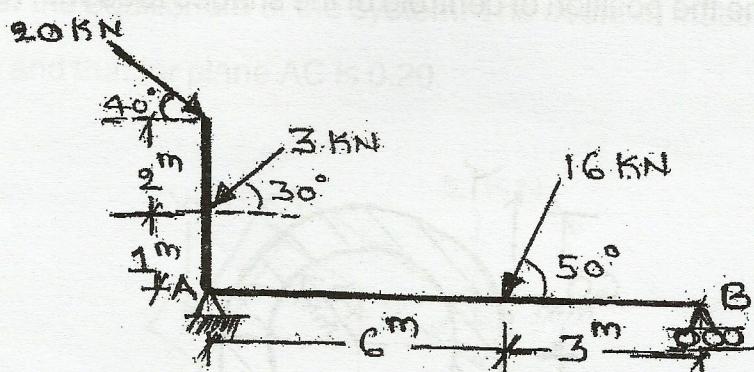


Fig. No. 4(a)

- b) A jib crane is subjected to a load of 5 kN as shown. Find the forces in the jib and tie.

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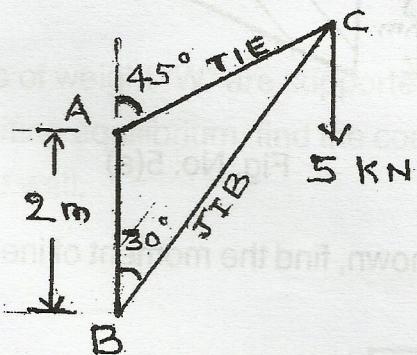


Fig. No. 4(b)

- c) Replace the given force system into a single force and couple acting at A.

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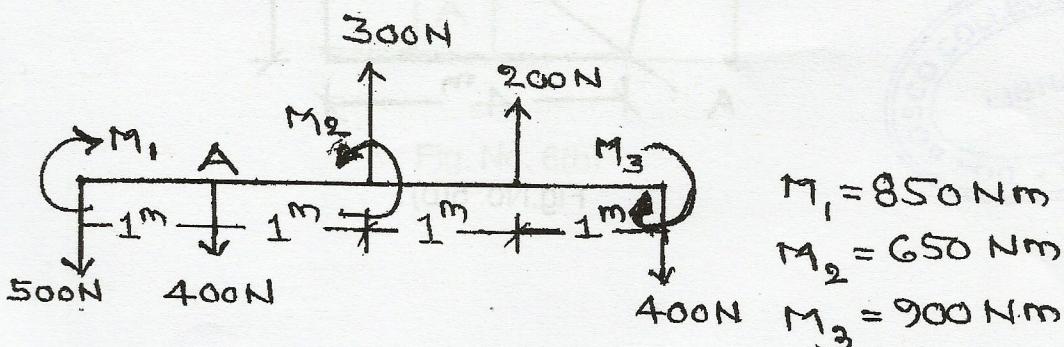


Fig. No. 4(c)



## MODULE – III

5. a) Determine the position of centroid of the shaded area with reference to axes shown.

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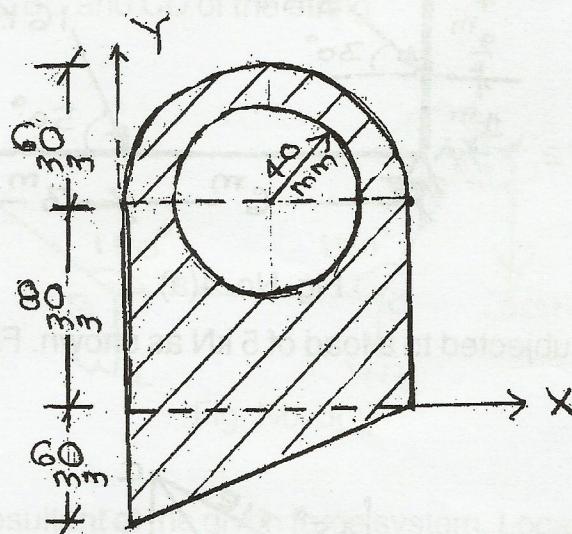


Fig. No. 5(a)

- b) For the plane area shown, find the moment of inertia about the axis AB.

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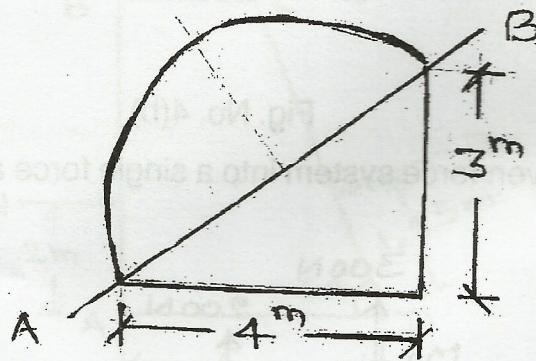


Fig. No. 5(b)

6. a) For the system shown, determine the minimum and maximum value of the load "W" for the equilibrium of the system. The coeff. of friction for the plane BC is 0.28 and that for plane AC is 0.20.

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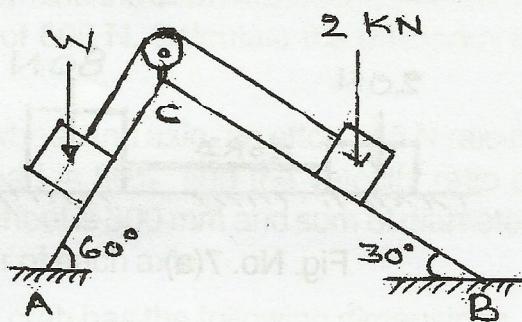


Fig. No. 6(a)

- b) Two identical blocks of weight "W" are supported by a rod as shown. If both the blocks are in limiting equilibrium, find the coeff. of friction, assuming it to be same at floor and wall.

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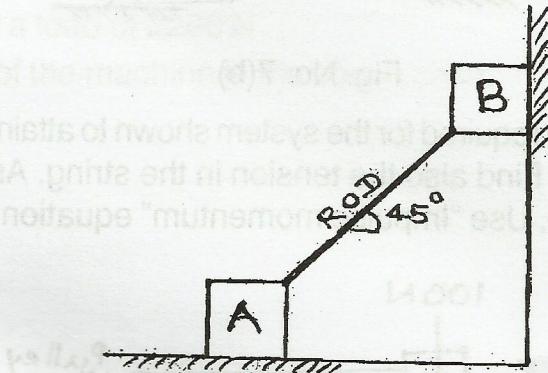
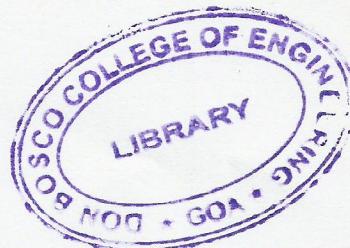


Fig. No. 6(b)





## MODULE – IV

7. Solve any two of the following :

- a) Two weights are connected by a cord as shown. A horizontal force of 400 N is applied to the system. Determine the acceleration of the system and also the tension in the cord. Use D'Alembert's principle. Assume coeff. of friction = 0.30.

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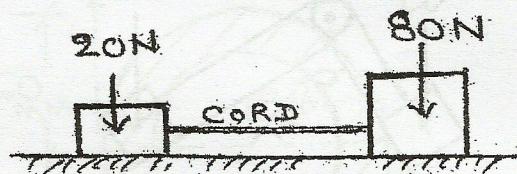


Fig. No. 7(a)

- b) Determine the distance covered by the system to attain a velocity of 30 m/sec, starting from the rest. Assume coeff. of friction =  $\mu = 0.20$ . Use "work energy" principle.

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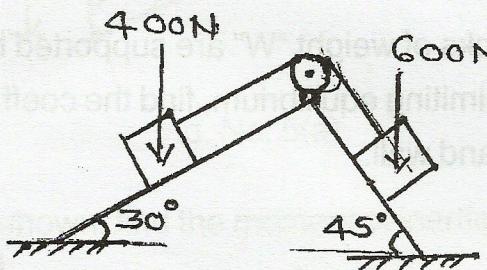


Fig. No. 7(b)

- c) Determine the time required for the system shown to attain a velocity of 5 m/sec, starting from rest. Find also the tension in the string. Assume coeff. of friction =  $\mu = 0.20$ . Use "Impulse momentum" equation.

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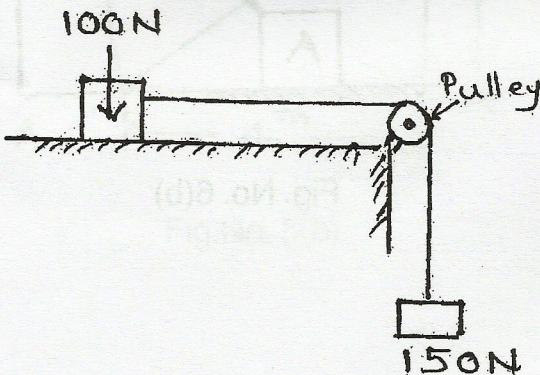


Fig. No. 7(c)



8. a) The law of a certain lifting machine is given by the relation

$$P = \frac{W}{50} + 8$$

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The velocity ratio is 100. Find maximum mechanical advantage and maximum efficiency. Also determine the effort required to overcome the machine friction, while lifting a load of 600 N. Calculate the efficiency of the machine at this load.

- b) With a differential wheel and axle, an effort of 6 N raised a load of 60 N. If the efficiency at this load is 80%, find the velocity ratio of the machine. If the diameter of effort wheel is 300 mm and sum of diameters of axles is 280 mm, determine diameter of each axle.

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- c) A double purchase crab has the following dimensions.

Diameter of load drum = 80 mm

Length of the handle = 180 mm

No. of teeth on pinions = 10 and 15

No. of teeth on spur wheels = 38 and 45.

It was found that an effort of 45 N was required to lift a load of 900 N and an effort of 68 N lifted a load of 1575 N. Determine :

- 1) Law of machine
- 2) Effort to lift a load of 2250 N
- 3) Efficiency of the machine in the above case.

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