



F.E. (Semester – I) (Revised in 2007-08) Examination, November/December 2009
BASIC CIVIL ENGINEERING AND ENGINEERING MECHANICS

Duration : 3 Hours

Max. Marks : 100

Instructions : 1) Attempt any five questions with atleast one question from each Module.

2) Figures to **right** indicate **full** marks.

3) Make suitable assumptions if **necessary**.

MODULE – I

1. a) What is the importance of Geotechnical Engineering in Civil Engineering ? 5
b) Write notes on : 6
 - i) Types of road
 - ii) Properties of hardened concrete.
- c) What is difference between simple and combined footing ? Also with neat sketch explain the two types of footings generally adopted for soft soil. 9
2. a) Give general classification of bridges. Draw a neat sketch of a typical steel bridge and explain its components. 8
b) Write notes on : 8
 - i) Self Compacting Concrete
 - ii) Manufacture of Concrete.
- c) What is Ready mix Concrete ? 4

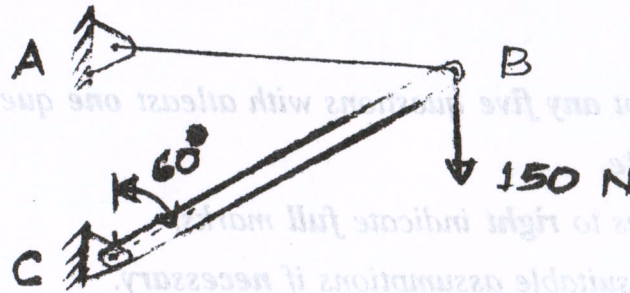
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MODULE – II

3. a) 150 N force is acting through point B as shown in fig. Resolve the force into oblique components, one acting along AB and other acting along BC.

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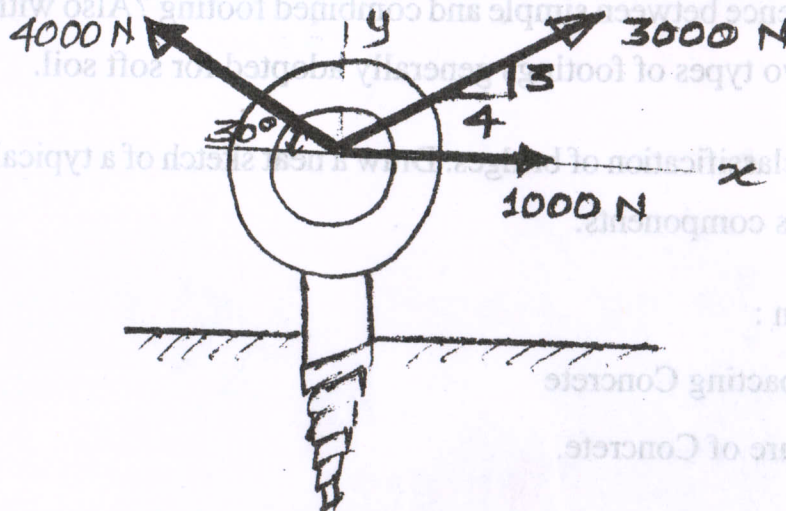
- b) State

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- Varignon's theorem and
- Principle of transmissibility of forces.

- c) An eye bolt is being pulled from ground by three forces as shown in fig. Determine the equilibrant required to prevent the eye bolt from coming out.

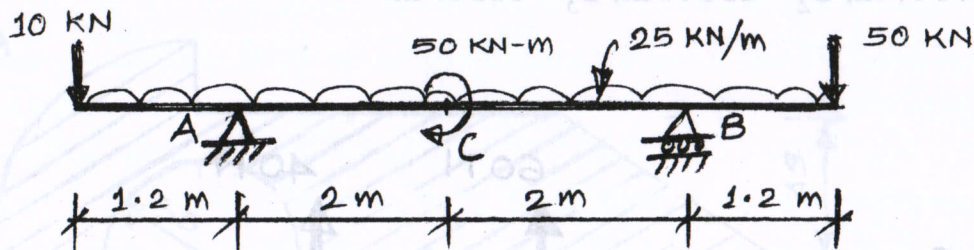
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d) Determine the support reactions for the beam shown in fig.

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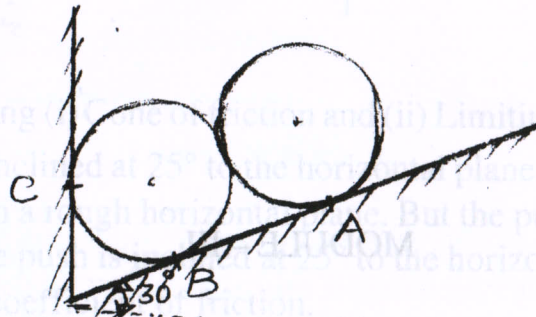


4. a) State Lami's theorem.

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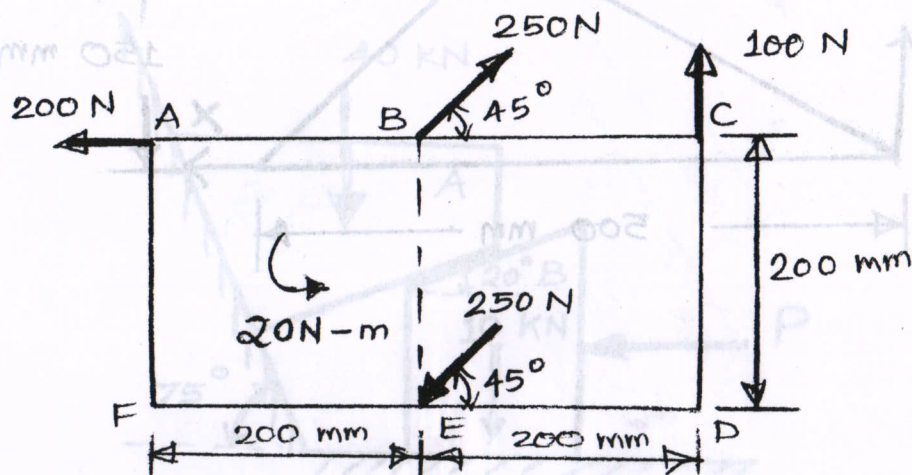
b) Two identical rollers each of mass 50 kg are supported by an inclined plane and a vertical wall as shown in fig. Assuming smooth surfaces, find the reactions induced at the point of support A, B and C.

7



c) A plate is subjected to loads as shown in fig. Find the resultant of the given loads from point D.

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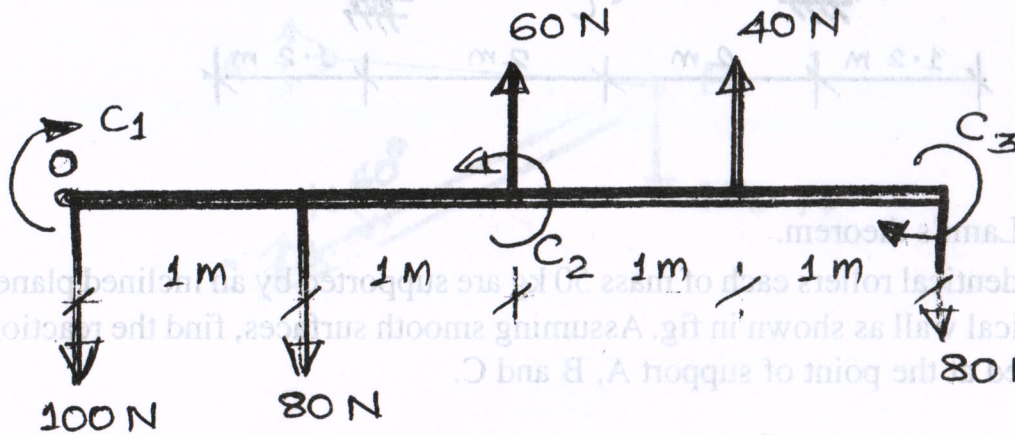




- d) Replace the force system acting on a bar as shown in fig. by a single force .

$$C_1 = 170 \text{ N-m}, C_2 = 130 \text{ N-m}, C_3 = 180 \text{ N-m}.$$

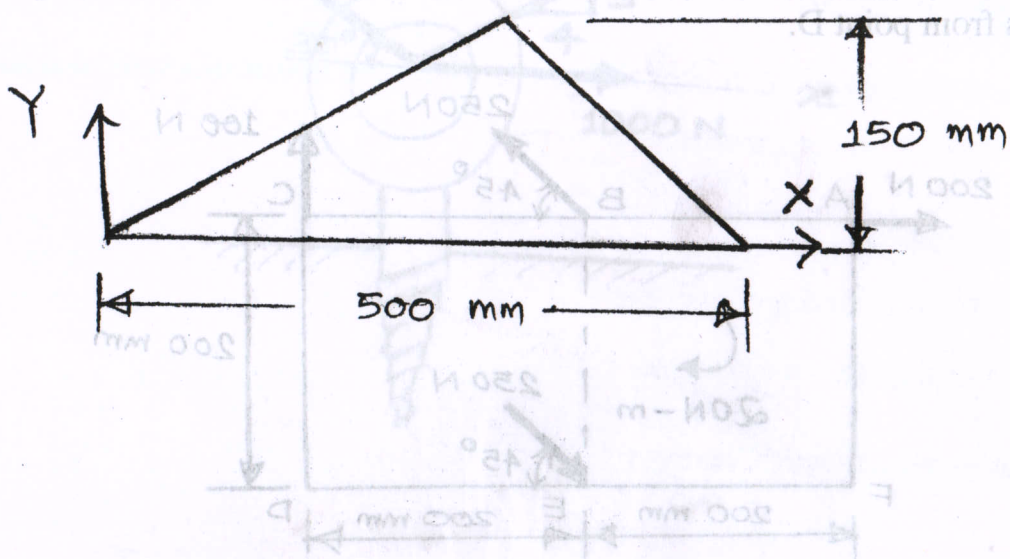
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MODULE - III

5. a) For a triangular area having base 500 mm and height 150 mm as shown in fig. locate its centroid w.r.t both X and Y-axis.

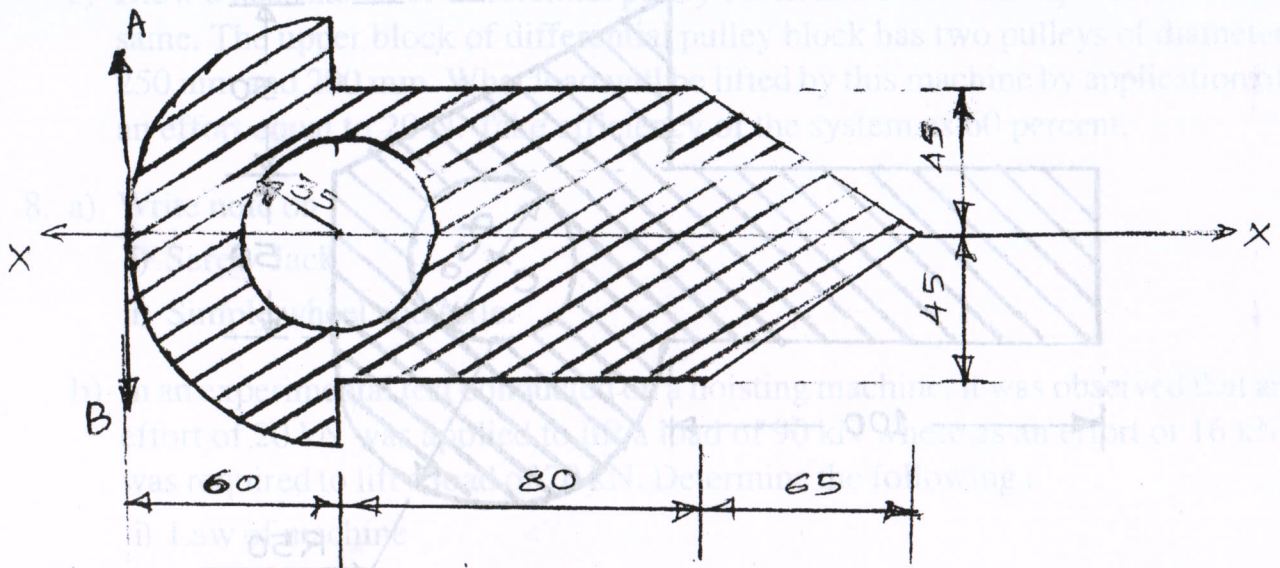
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- b) Find the M.I. of a plane lamina shown in fig. about the axis AB and X-axis.

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- c) Define the following (i) Cone of friction and (ii) Limiting friction.

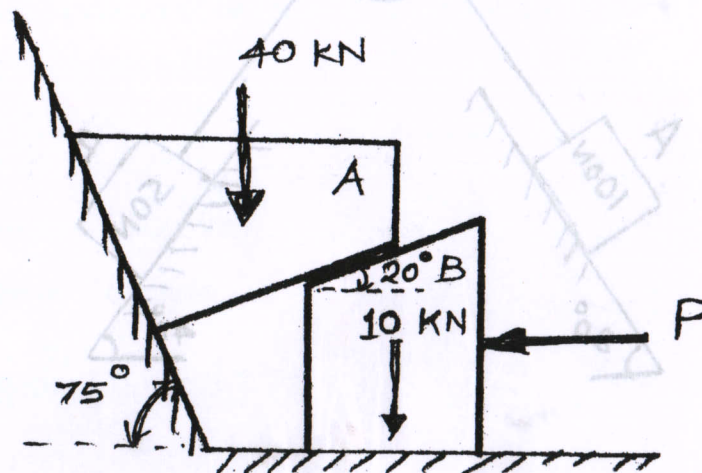
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- d) A pull of 60 N is inclined at 25° to the horizontal plane, is required just to move the body placed on a rough horizontal plane. But the push required to move the body is 75N. If the push is inclined at 25° to the horizontal, find the weight of the body and the coefficient of friction.

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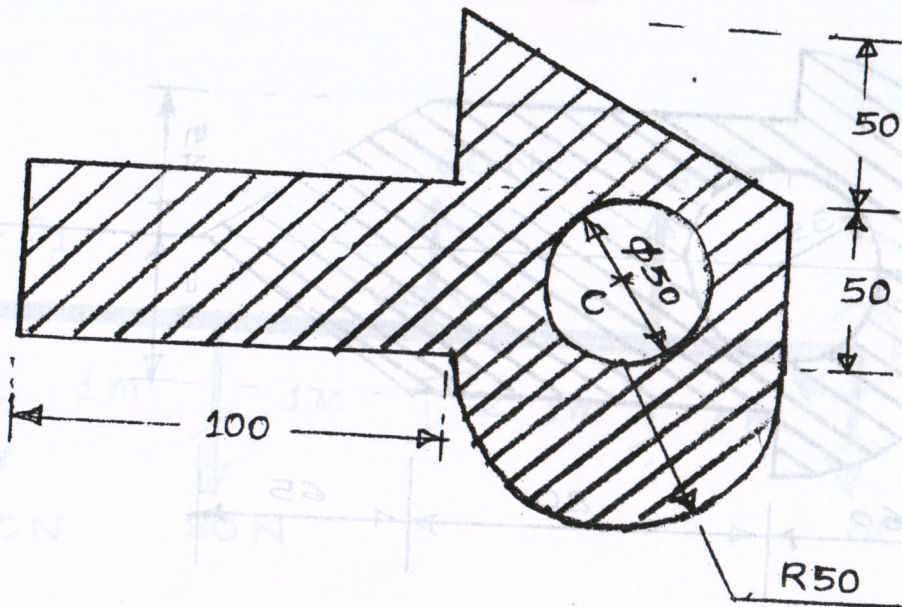
6. a) A block 'A' weighing 40 kN is placed on another block B weighing 10 kN as shown in fig. The angle of friction for all contact surfaces is $\phi = 16^\circ$. Find the force P applied to the lower block B so as to just start the upward motion of Block A.

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- b) Locate the centroid for the area shown.

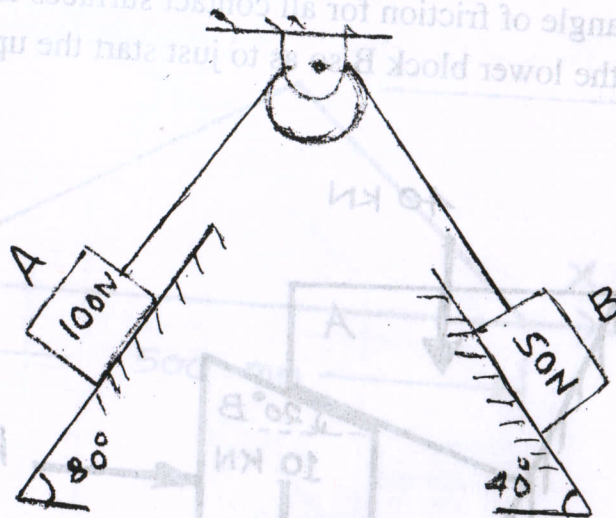
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MODULE - IV

7. a) Find the acceleration of blocks and tension in the string for downward motion of block A. Take $\mu = 0.3$ for block A and angle of static friction as 16° for block B. Consider pulley to be smooth.

10





b) State and explain the impulse momentum equation. 3

c) Draw a neat sketch of differential pulley block and derive an expression for the same. The upper block of differential pulley block has two pulleys of diameter 250 mm and 200 mm. What load will be lifted by this machine by application of an effort equal to 20 N. Take efficiency of the system as 60 percent. 7

8. a) Write note on : 8

i) Screw Jack

ii) Simple wheel and Axle.

b) In an experimental test conducted on a hoisting machine, it was observed that an effort of 20 kN was applied to lift a load of 90 kN where as an effort of 16 kN was required to lift a load of 70 kN. Determine the following : 8

i) Law of machine

ii) The limiting mechanical advantage

iii) The limiting efficiency

iv) The effort required to lift a load of 15 kN.

What would be the mechanical advantage and efficiency of the machine at this moment ? Take velocity ratio as 25.

c) Explain the work energy principle with an example. 4

c) What is difference between _____ and combined footing ? Also with neat sketch explain the two types of footings generally adopted for soft soil.

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b) Write notes on :

i) Self Compacting Concrete

ii) Manufacture of Concrete.

c) What is Ready mix Concrete ?