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FE - 1-3 (RC)

**F.E. (Sem. – I) Examination, November/December 2007
(Revised Course)**

BASIC CIVIL ENGINEERING AND ENGINEERING MECHANICS

Duration : 3 Hours

Max. Marks: 100

- Instructions:**
- 1) Attempt any five questions with at least one question from each Module.
 - 2) Figures to the right indicates full marks.
 - 3) Make suitable assumptions if necessary.

Module – I

1. a) Discuss the scope of the following fields of Engineering. (3×2=6)
 - i) Structural Engineering.
 - ii) Transportation Engineering.
- b) Write short notes on: (3×3=9)
 - i) Steel Bridges.
 - ii) Ready mix concrete.
 - iii) Structural Forms of steel.
- c) Distinguish between Load bearing structure and framed structure. 3
- d) What precautions should be taken while placing the concrete in the formwork ? 2
2. a) Explain in brief the various ingredients in concrete. Also state the properties of hardened concrete. 7
- b) State the components of the roads and their functions. 6
- c) Explain the use of Aluminium as a building material. 5
- d) What type of foundation is generally used when soft soil is encountered on site ? 2

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Module – II

3. a) State the characteristics of a couple.
b) Draw neat free body diagrams of the cylinders shown in figure below.

Assume weight of each cylinder as 'W'.

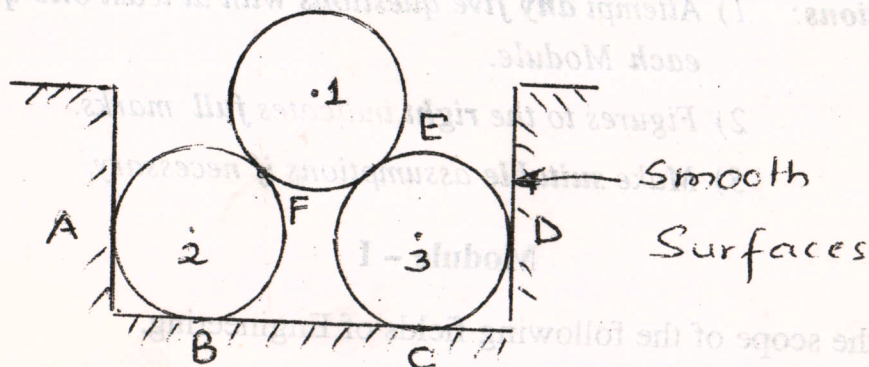


Fig. Q. 3 (b)

- c) A non-Concurrent coplanar force system is shown in the figure below. Determine the magnitude of P to make the resultant of all the given forces inclusive of P to pass through point A.

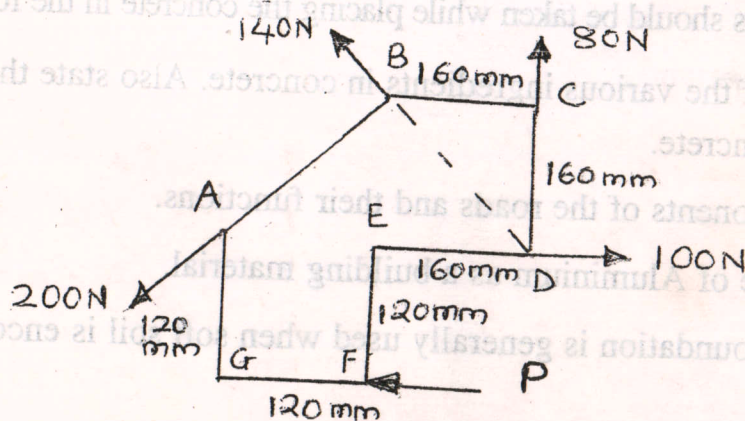


Fig. Q. 3 (c)

- d) A ladder of length $2L$ and weight W rests at an angle of 30° to the horizontal with its ends resting on a smooth floor and against a smooth wall. One end of a string is attached to the lower end of the ladder and the other end of the string is attached to the junction of the wall and the floor. Find the tension in the string.

Also find the tension in the string if a man whose weight is one-half that of the ladder, has ascended the ladder two-third of its length.

4. a) Explain with neat sketches the various types of support for the beams. 3
- b) Find ' θ ' required for equilibrium of given system of forces acting on the cylinder. 6

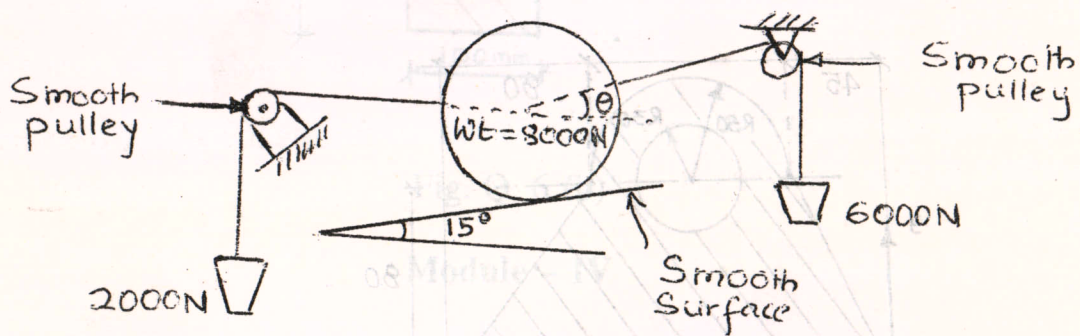


Fig. Q. 4 (b)

- c) Determine the support reactions for the beam shown below. 5

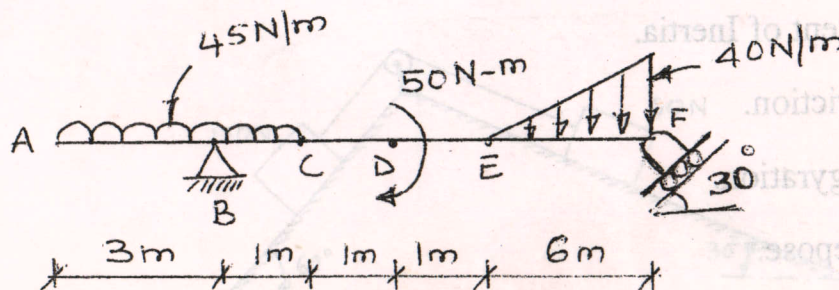


Fig. Q. 4 (c)

- d) Find the value of P & F so that the four forces shown in the figure produce an upward resultant of 3N acting at 4m from left end of the bar.

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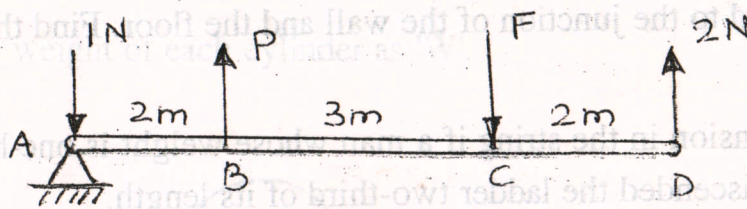


Fig Q. 4 (d)

Module - III

5. a) Locate the centroid of the shaded plane area given in the figure below.

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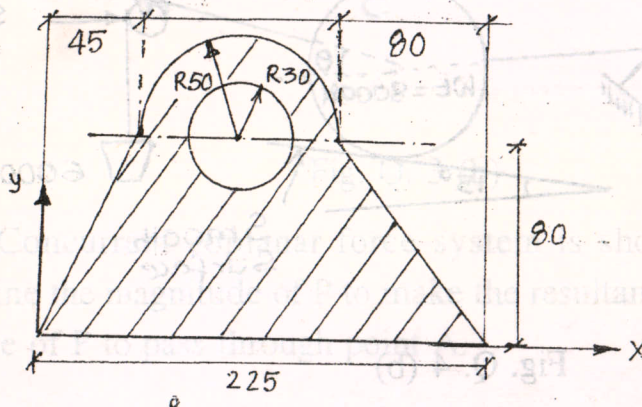


Fig. Q. 5 (a)

- b) Define:

4

- i) Polar moment of Inertia.
- ii) Limiting friction.
- iii) Radius of gyration.
- iv) Angle of repose.

- c) The block A weighs 2000 N. The chord attached to A passes over a frictionless Pulley and supports a weight equal to 800 N. The value of coefficient of friction between A and the horizontal plane is 0.35. Find the force P if the motion is impending towards the left.

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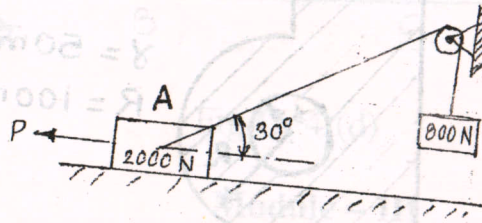


Fig. 5 (c)

6. a) Neglecting the weight of the wedge, determine the magnitude of the force P required to raise the 5000 N weight. Take $\mu = 0.3$ for all the surfaces.

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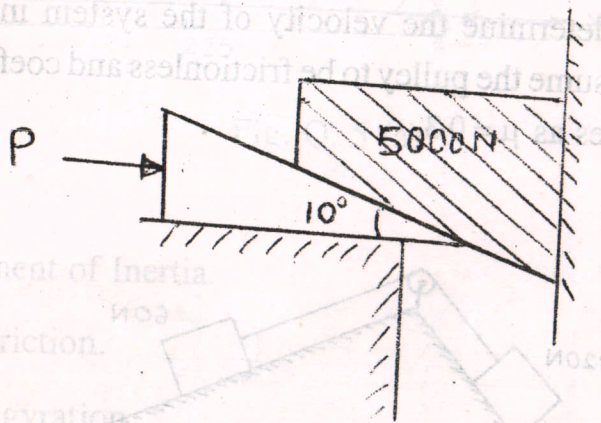


Fig. Q. 6 (a)

- b) Find moment of inertia about centroidal Y-Y axis.

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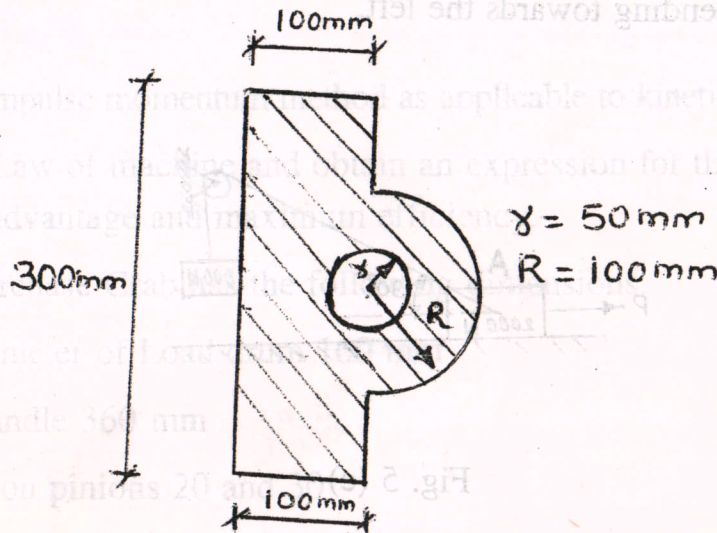


Fig. Q. 6 (b)

Module - IV

7. a) Find the acceleration and tension in the string of the system shown in the figure below. Also determine the velocity of the system in 4 seconds after starting from rest. Assume the pulley to be frictionless and coefficient of friction for all contact surfaces as $\mu = 0.3$.

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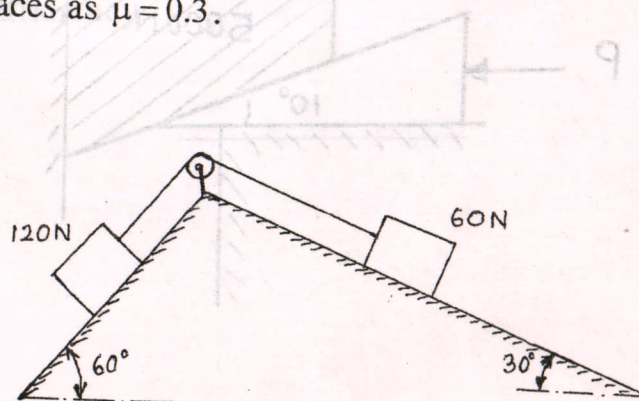


Fig. Q. 7 (a)

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- b) Draw a neat sketch of worm and worm wheel and derive an expression for the velocity ratio. 7
- c) Differentiate between reversible and irreversible machines, giving examples of each. 3
8. a) Explain the impulse momentum method as applicable to kinetic problems. 6
- b) Explain the Law of machine and obtain an expression for the maximum mechanical advantage and maximum efficiency. 6
- c) A double Purchase Crab has the following dimensions. 8

Effective diameter of Load drum 160 mm

Length of handle 360 mm

No. of teeth on pinions 20 and 30

No. of teeth of Spur wheels 75 and 90

When tested it was found that an effort of 90N was required to lift a load of 1800 N and an effort of 135 N was required to lift a load of 3150 N.

Determine :

- Law of machine
- Probable effort to lift a load of 5000 N
- Efficiency in the above case
- Maximum Efficiency.

a) Explain in brief the various ingredients in concrete. Also state the properties of hardened concrete.

b) State the components of the roads and their functions.

c) Explain the use of Aluminium as a building material.

d) What type of foundation is generally used when soft soil is encountered on site?