Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐

R 3649

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2007.

Third Semester

Mechanical Engineering

ME 1206 — APPLIED ENGINEERING MECHANICS

(Common to Aeronautical Engineering/Automobile Engineering/Mechatronics Engineering/Marine Engineering/Metallurgical Engineering and Production Engineering for candidates admitted in 2006 only)

(Regulation 2004)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State triangle law of forces. What is the use of this law?

2. What is 'Principle of transmissibility'?

3. With the help of a simple illustration define free body diagram.

4. A simply supported beam of 6 m span carries a concentrated load P at 2 m from the left end. If the support reaction at the left end support is 8 kN, find P.

5. State Parallel axis theorem.

6. Define polar axis of a cross section. What is the value of moment of inertia of a circular section of 50 mm radius about this axis?

7. State the laws of static friction.

8. State the Impulse Momentum principle. Write its equation form, stating the meaning of each term in it.

9. Derive the relation between angular velocity and linear velocity.

10. A body is rotating with an angular velocity of 5 radians/sec. After 4 seconds, the angular velocity of the body becomes 13 radians/sec. Determine the angular acceleration of the body.

11. (a) Fig. 11 (a) shows the coplanar system of forces acting on a flat plate. Determine the resultant and the x and y intercepts of the resultant.
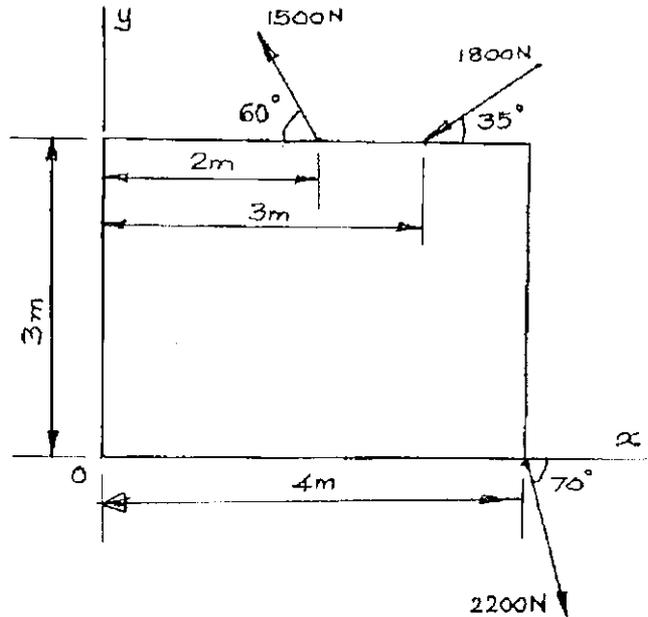

Fig. 11 (a)

Or

(b) A force P is directed from a point $A(4, 1, 4)$ metres towards a point $B(-3, 4, -1)$ metres. If it causes a moment of $M_z = 1900$ Nm, determine the moment of P about x and y axes.

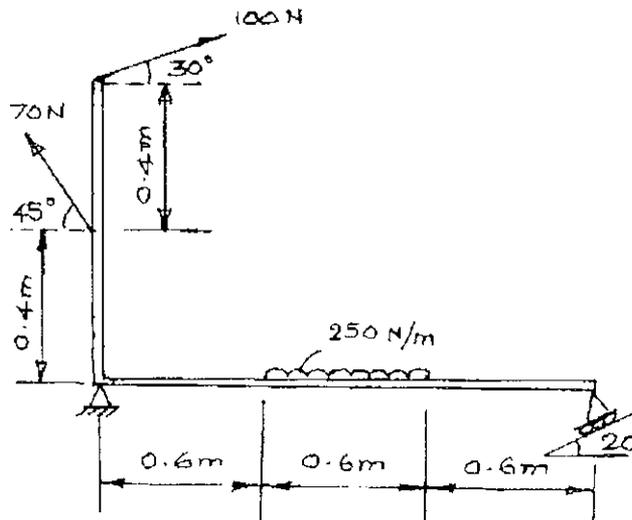12. (a) Find the reactions at the supports of the L bent shown in Fig. 12 (a).

Fig. 12 (a)

Or

(b)   Two identical rollers each of weight 50 N are supported by an inclined plane and a vertical wall as shown in Fig. 12 (b). Determine the reactions at the points of support A, B and C assuming all surfaces to be smooth. Also find the reciprocal force between the spheres.
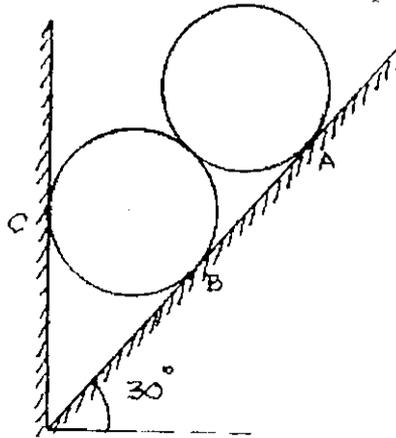
Fig. 12 (b)

13.   (a)   For the plane section shown in Fig. 13 (a) determine the moment of inertia about its horizontal and vertical centroidal axes.
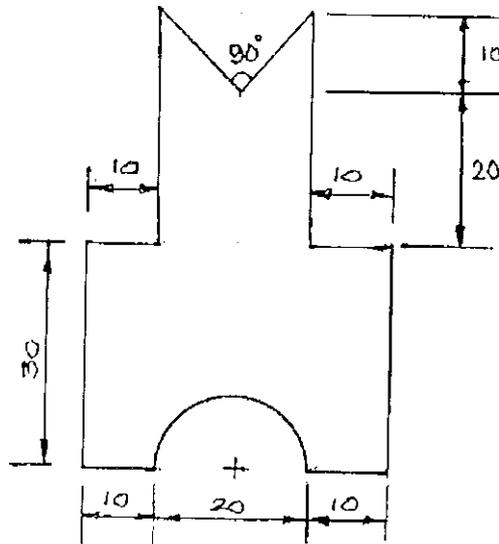
Fig. 13 (a)

All dimensions are in mm

Or

(b)   From first principles derive the expressions for the mass moment of inertia of a right circular cone about (i) an axis through the vertex and perpendicular to the base and (ii) an axis through the vertex and parallel to the base.

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14. (a) A force of 200 N is required to just move a certain body up an inclined plane of angle 15°, the force being parallel to the plane. If the angle of inclination of the plane is made 20°, the force required again parallel to the plane is found to be 230 N. Find the weight of the body and the coefficient of friction.

Or

(b) A body weighing 196.2 N slides up a 30° inclined plane under the action of an applied force of 300 N acting parallel to the plane. The coefficient of friction is 0.2. The body moves from rest. Determine at the end of 4 seconds, the acceleration, distance travelled, velocity, kinetic energy, work done, momentum and impulse applied on the body.

15. (a) A cylinder of radius 1 m rolls without slipping along a horizontal plane AB. Its centre has uniform velocity of 20 m/sec. Find the velocity of points E and F on the circumference of the cylinder shown in Fig. 15 (a).
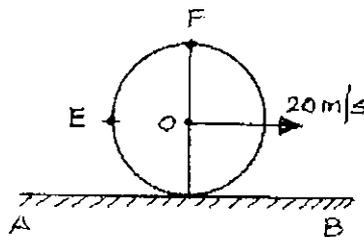

Fig 15 (a)

Or

(b) The crank of a reciprocating engine is rotating at 210 rpm. The lengths of the crank and the connecting rod are 200 mm and 1 m respectively. Find the velocity of the point A (i.e. velocity of piston), when the crank has turned through an angle of 45° with the horizontal as shown in Fig. 15 (b).
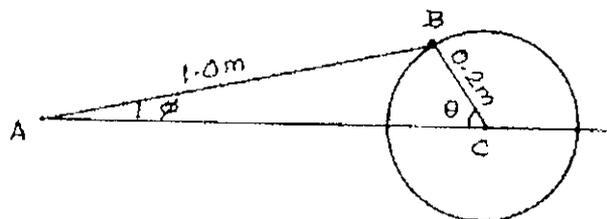

Fig. 15 (b)

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