

AN ROINN OIDEACHAIS

(Department of Education.)

BRAINNSE AN MHEADHON-OIDEACHAIS

(Secondary Education Branch).

LEAVING CERTIFICATE EXAMINATION, 1944.

APPLIED MATHEMATICS.—PASS.

THURSDAY, 22nd JUNE.—AFTERNOON, 4 TO 6.

Not more than six questions may be answered. All questions are of equal value.

Mathematical Tables may be obtained from the Superintendent.

1. A body of weight 10 lb is supported by two strings attached to it and is acted on by a horizontal force of 4 lb wt. In the position of equilibrium the strings are on opposite sides of the vertical and are each inclined at 60° to it. All the forces acting on the body are in the same vertical plane. Find the tension in each string.

2. A uniform rod AB, 4 feet long weighing 8 lb. is hinged to a vertical wall at A and is kept in a horizontal position by a string BC attached to a point in the wall 3 feet vertically above A. A 12 lb. wt. is suspended from a point in the rod 3 feet from A. Find the tension in the string and the horizontal and vertical components of the reaction at the hinge.

3. A body weighing 20 lb. is kept in equilibrium on a smooth plane inclined at 30° to the horizontal by means of a cord inclined at 15° to the plane. Find the tension in the cord.

4. A piece of wire 12 inches long is cut into two parts which are joined so as to form a letter T. The upright is 8" long. Find the distance of the centre of gravity from the lower end. If it is suspended from one extremity of the cross-piece, find the inclination of the latter to the horizontal.

5. Show how to find from the velocity-time graph

(a) the total distance moved in a given time;

(b) the average velocity during a given time;

(c) the acceleration at a given instant.

Show that in the case of uniformly accelerated motion the average velocity during a given time is the average of the initial and final velocities.

6. A bomb is released from an aeroplane which is 2,000 feet above the ground and which is travelling horizontally at 210 miles per hour. What is the horizontal distance of the target from the aeroplane at the moment of release? What is the velocity of the bomb, in magnitude and direction, just before striking the target? Neglect air resistance.

7. Explain by means of diagrams what you mean by (a) the *sum*, (b) the *difference* of two velocities which are not in the same direction.

A man is cycling due east at 10 miles per hour and the wind is blowing from the north-west at 10 miles per hour. What is the velocity of the wind relative to the man?

8. A block of iron, 8 lb. wt., is placed on a smooth table and is connected by a light string, passing over a light, smooth pulley at the edge of the table with a scale-pan of weight 1 lb. A 3-lb. weight is placed in the scale-pan. Find the tension in the string and the acceleration when the system is in motion. Find also the thrust of the 3-lb. weight on the scale-pan.

9. A railway truck weighing 2 tons moving at 8 miles per hour overtakes a truck weighing one ton moving at 2 miles per hour on the same track. Assuming that they remain together during the subsequent motion find the common velocity immediately after impact. What is the constant force that would bring the trucks to rest 8 feet from the place of impact.