AN ROINN OIDEACHAIS

(Department of Education).

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(Secondary Education Branch).

LEAVING CERTIFICATE EXAMINATION, 1950.

APPLIED MATHEMATICS—PASS.

FRIDAY, 16*th 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.

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1. The end A of a uniform rod AB which weighs 10 lb. is hinged smoothly to a vertical wall, and the rod is kept inclined at 30° to the wall (i) by a force applied at B vertically, (ii) by a force applied at B at right angles to the rod. Find the force in each case and show that the force in (ii) is the least force which will keep the rod in that position.

2. A balloon, starting from rest on the ground, ascends vertically with uniform acceleration of 4 feet per sec.^{2}, and after 8 secs. a stone drops from it. Find how long the stone takes to reach the ground.

3. An aeroplane can fly horizontally at 200 miles per hour in still air. When the wind is blowing at 60 miles per hour from the south east, in what direction by compass must the aeroplane be steered so that it may travel due south, and how long will it take to travel 300 miles due south ?

4. When a train is travelling on a horizontal track with an acceleration of 8 feet per sec.^{2}, a box in the guard's van is about to slide along the floor. Find (*a*) the coefficient of friction between the box and the floor, (*b*) the greatest acceleration with which the train may ascend a slope inclined at 10° to the horizontal if the box is not to slide along the floor.

5. A plank AB, 12 feet long and weighing 100 lb., is suspended horizontally by means of two vertical ropes attached to it at A and B, respectively. A boy, weighing 60 lb., walks along the plank from A towards B. When he is 2 feet from A, the tensions in the ropes are equal. Find (*a*) how far the centre of gravity of the plank is from A, (*b*) the tensions in the ropes when the boy is 2 feet from B.

6. A train and its engine weigh 200 tons and the resistance to motion is always 20 lb. wt. per ton. When the train is travelling at a uniform speed of 30 miles per hour on a horizontal track, find (a) the H.P. at which the engine is working, (b) how far from a station a coach weighing 12 tons must be slipped so that it may come to rest at the station.

7. Two bodies, A and B, each weighing 8 oz., are connected by a light string which passes over a smooth pulley at the edge of a smooth horizontal table. A is held at rest on the table at a distance of 3 feet from the pulley and B hangs freely. Find (a) how long, after it is released, A takes to reach the pulley, (b) the tension in the string during the motion.

8. A thin uniform wire is bent so as to form a right angle ABC, the arms AB, BC of the angle being 16 inches and 48 inches long, respectively. Find the position of the centre of gravity.

If the wire is suspended by means of a piece of thread attached to it at B so that it hangs freely, find the angle which the arm AB of the right angle makes with the vertical.

9. A liquid of specific gravity 0·8 is poured into a cylindrical vessel of internal diameter 10 inches to a depth of 28 inches. Find, in lb. wt., the total thrust on the bottom of the vessel.

When an object weighing 100 lb. is held in suspension in the liquid so that it is totally immersed, the total thrust on the bottom of the vessel is increased by 40 lb. wt. Find the specific gravity of the object.

[1 cu. ft. of water weighs 62¼ lb.]