AN ROINN OIDEACHAIS
(Department of Education).

BRAINNSE AN MHEADHON-OIDEACHAIS
(Secondary Education Branch).

LEAVING CERTIFICATE EXAMINATION, 1939.

PASS.

APPLIED MATHEMATICS.

WEDNESDAY, 21st JUNE.—AFTERNOON 4 TO 6 P.M.

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

Mathematical Tables may be obtained from the Superintendent.

---

1. A motor car starting from rest travels along a straight road and is accelerated uniformly until it reaches a speed of 30 miles per hour at the end of half a minute. During the next half minute it is accelerated uniformly up to 40 miles per hour at which speed it continues for two minutes. It is then brought to rest in half a minute with a uniform retardation.

Draw a velocity-time diagram to represent the journey and from your graph find the total distance covered.

2. Explain the terms "speed," "velocity," "relative velocity," "angular velocity."

What is the angular velocity of (i) the minute hand, (ii) the hour hand of a clock? How soon after one o'clock will the hands be inclined at an angle of 80°?

3. Prove that the algebraic sum of the moments of two parallel forces about any point in their plane is equal to the moment of their resultant about the same point.

A uniform plank, 6 feet long, is supported in a horizontal position by two trestles half a foot from each end. The plank weighs 100 lb. Find the greatest weight that can be suspended from one end without disturbing the equilibrium of the plank.

4. A uniform bar of weight W can turn in a vertical plane about a hinge at one end A, and to the other end B is tied a light inextensible string which passes over a smooth pulley C vertically above A so that AC=AB. Find the tension in the string necessary to keep the bar at an angle of 30° upward from the horizontal. Find also the direction and magnitude of the reaction at the hinge.

5. Sketch a pulley system in which separate ropes are used for each of its three movable pulleys and have one end attached to a fixed bar. If the power rope passes downward over a fixed pulley how far will its end descend when the weight is raised 1 inch ? Find the relation between the power (P), the weight (W), and the weight of each pulley (w).

6. A wooden chessboard 16 inches square is made up of sixty-four equal squares. If one of the two-inch corner squares were broken off, find the distance from the opposite corner of the centre of gravity of the remainder.

[Answer in inches to one place of decimals.]

7. Prove the formula $s=ut+\frac{1}{2}\ ft^2$, where f is the constant acceleration.

In a 100 yards race a man starts off with a speed of 15 feet per second and increases his speed uniformly until he reaches a speed of 30 feet per second. He then maintains this speed until the finish and his time for the whole distance is $10\frac{1}{2}$ seconds. What distance did he cover before he reached his greatest speed ?

8. Two smooth inclined planes of equal height, whose inclinations are 30° and 45° to the horizontal, are placed back to back. Two equal masses of 10 lb. each are connected by a light inextensible string passing round a small smooth pulley at the common vertex of the planes. If all frictional resistances are negligible and the masses are allowed to move, find the acceleration of the system and the tension in the string.

9. A railway wagon weighing 3 tons moving at 8 miles per hour collides with a stationary wagon weighing 2 tons and they move on together a distance of 100 yards before coming to rest. Find the common velocity immediately after the impact and the total resistance, assumed uniform, which brings the wagons to rest.

10. A golf ball is projected at an angle of 15° from a point in a horizontal plane and strikes the plane 400 feet away. Find the initial velocity of the ball.

What is the greatest distance that could have been obtained by this initial velocity if the best angle of projection had been used for the purpose ?