

AN ROINN OIDEACHAIS

(Department of Education).

BRAINSE AN MHEÁN-OIDEACHAIS

(Secondary Education Branch).

LEAVING CERTIFICATE EXAMINATION, 1949.

APPLIED MATHEMATICS—PASS.

SATURDAY, 18th 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 10 lb. weight hangs from a fixed point by a light string of length 5 feet. Find (i) the horizontal force, (ii) the magnitude and direction of the least force required to hold the weight a horizontal distance of 3 feet away from the vertical through the fixed point.

2. A tapering log AB is 24 feet long and it rests horizontally on two supports C, D which are 4 and 6 feet, respectively, from A and B. A vertical pull of 280 lb. wt. applied at A will just raise the log off the support C; a vertical pull of 350 lb. wt. applied at B will just raise the log off the support D. Determine the weight of the log and the position of its centre of gravity.

3. Explain the terms: "coefficient of friction", "angle of friction".

A block of 5 lb. wt. can just rest without slipping on a plane which is tilted to an angle of 25° with the horizontal. Find the least force, in magnitude and direction, that will hold the block at rest when the plane is tilted to an angle of 45° .

4. Define "couple" and "moment of a couple".

Prove that three forces represented completely by the sides AB, BC, CA of a triangle ABC taken in order are equivalent to a couple whose moment is represented by twice the area of the triangle.

5. A carriage after being slipped from a train is uniformly retarded by the brakes and stops in 50 secs. By this time the train is 550 yards away from the carriage. Find the speed of the train, assuming that it travels at the same uniform speed throughout.

6. A mass of 5 lb. hangs from a spring balance attached to the ceiling of a lift. What will be the reading of the balance when the lift—

- (a) ascends with an acceleration of 4 ft./sec.^2 ,
- (b) descends with an acceleration of 4 ft./sec.^2 ,
- (c) descends with a uniform speed of 4 ft./sec.

Explain the principles involved.

7. The side of a plane lamina in the form of a regular hexagon ABCDEF is 2 inches long. The lamina is cut in two along the diagonal AD. Find the distance of the centre of gravity of the half ABCD from the edge BC.

8. An engine is used to pump water to a height of 60 feet and to deliver it at that height with a velocity of 30 miles per hour. If 240 gallons of water are delivered per minute, find the horsepower at which the engine is working.

[One gallon of water weighs 10 lbs.]

9. A trough with a square base of side one foot is filled with water to a depth of 15 inches. Find the total thrust on the base.

If a piece of iron, of specific gravity 7, weighing 1 lb. is held suspended and totally immersed in the water, find the total thrust on the base of the trough.

[1 c. ft. water weighs $62\frac{1}{2}$ lbs.]