

AN ROINN OIDEACHAIS

(Department of Education).

BRAINSE AN MHEÁN-OIDEACHAIS

(Secondary Education Branch).

LEAVING CERTIFICATE EXAMINATION, 1955.

APPLIED MATHEMATICS—PASS.

THURSDAY, 16th JUNE.—AFTERNOON, 2.30 TO 4.30.

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

Mathematical Tables may be obtained from the Superintendent.

1. Forces of 3, 5, 6 lb. wt. act along the lines OA, OB, OC respectively, the angles AOB, BOC, AOC being 60° , 90° , 150° respectively. If R is the resultant of the three forces, find

- (i) the components of R along OB and along OC;
- (ii) the magnitude of R, correct to one decimal place;
- (iii) the angle which the line of action of R makes with OB.

2. A uniform rod AB is 10 inches long and weighs 2 lb. The rod is supported horizontally by two vertical strings, one attached to it at C and the other at D, where $AC=1$ inch and $BD=2$ inches. Find the tension in each of the strings.

Where should a mass of 4lb. be attached to the rod so that the tension in the string at C would be twice the tension in the string at D?

3. A horizontal force of 3lb. wt. will just cause a block weighing 5lb. to move along a rough plane when the plane is horizontal. Find the coefficient of friction between the block and the plane.

If the plane were tilted to make an angle of 20° with the horizontal, what is the least force acting along the line of greatest slope of the plane that would just cause the block to move up the plane?

4. A piece of uniform wire is bent so as to form an isosceles triangle ABC in which $AC=BC=5$ inches and $AB=8$ inches. Find the distance of the centre of gravity from the base AB.

If the wire is suspended at A so that it hangs freely, what angle will AB make with the vertical?

5. From a point 16 feet above the ground a ball is thrown vertically upwards with an initial velocity of 24 feet per second. Find (i) the greatest height which it reaches, (ii) the total time it takes to reach the ground, and (iii) the velocity with which it strikes the ground.

6. By accelerating uniformly from rest until he has attained a speed of 16 feet per second and then continuing uniformly at that speed a cyclist covers 912 feet in 60 seconds. Find his uniform acceleration.

7. State the theorem of the Triangle of Forces and its converse. A uniform bar AB is 12 inches long and weighs 8 lb. The bar is supported by two strings AC and BC which are attached to a fixed peg at C. If AC=10 inches and BC=6 inches, find, graphically or otherwise, the tension in each of the strings.

8. A car weighing 18 cwt. is travelling on a level road. If the frictional resistances to motion are equivalent to 40 lb. wt. per ton, find the horse-power at which the car is working

- (i) when it has a uniform velocity of 30 m.p.h. ;
- (ii) when it has a velocity of 30 m.p.h. and is accelerating at the rate of $1\frac{1}{2}$ feet per second per second.

9. State the Principle of Archimedes, and describe briefly how you would test it by experiment.

When an object weighing 10 gm. is suspended by a vertical string so that it is totally immersed in water, the tension in the string is 8 gm. wt. When it is similarly suspended in oil, the tension in the string is 8.3 gm. wt. Find the specific gravity of the oil.