LEAVING CERTIFICATE EXAMINATION, 1951.

APPLIED MATHEMATICS—PASS.

SATURDAY, 9th JUNE.—Morning, 10 to 12.

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 5 and 6 lb. wt. act along the lines BA and BC respectively. If the angle ABC is 30°, find the magnitude of their resultant correct to one place of decimals.

Find also the angle which their resultant makes with BA.

2. A uniform beam AB, of length 4 feet and weight 30 lb., is smoothly hinged at A and is held in a horizontal position by a chain CB attached to a support at C, 3 feet vertically above A. Calculate the tension in the chain and the magnitude and direction of the reaction of the hinge.

3. Show how velocities are compounded, and explain the terms "component velocity," "resultant velocity."

A river is 220 feet wide and is flowing at $1\frac{1}{2}$ m.p.h. A boatman can row at 3 m.p.h. in still water. What is the least time in which he can cross the river if he does not mind where he lands ?

How far down the river will he have drifted in that time ?

4. What is meant by the centre of gravity of a body ?

A circular hole of diameter 1 inch is made in a thin circular disc of diameter 5 inches so that the centre of gravity of the remainder is $\frac{1}{20}$ inch from the centre of the disc. How far is the centre of the hole from the centre of the disc ?

5. An electric tramcar travelling between two stopping places 1,200 feet apart is uniformly accelerated from rest for 10 seconds, during which period it covers 100 feet. It then runs with constant speed for 1,050 feet and is finally retarded uniformly in the last 50 feet. Find the total time taken by the tramcar to travel the 1,200 feet.

6. Explain the term " coefficient of friction."

A block of 4 lb. wt. can just rest without slipping on a plane making an angle of 30° with the horizontal. Find the coefficient of friction between the block and the plane.

What is the least horizontal force that will hold the block at rest when the plane makes an angle of 45° with the horizontal ?

7. Two masses weighing 6 ounces and 4 ounces, respectively, are connected by a light inextensible string which passes over a smooth pulley. Find the acceleration of the masses and the tension in the string during motion.

If the string is cut when the smaller mass has risen 2 feet from its starting point, how much farther will the mass ascend ?

8. A stone is projected vertically upwards with a velocity of 80 feet per second from the bottom of a mine-shaft 96 feet deep. Find

(a) how long the stone takes to return to the bottom of the shaft,

(b) the greatest height reached,

(c) how long the stone is above ground-level.

9. A cone filled with water stands with its base on a horizontal table. The base area of the cone is 30 square inches, and its height is 6 inches. Show that the thrust on the base of the cone due to the water is 3 times the weight of the contained water.

If $\frac{1}{8}$ of the volume of water in the cone were drained off, what would be the thrust on the base due to the remaining water ?