AN ROINN OIDEACHAIS M47

LEAVING CERTIFICATE EXAMINATION, 1965

APPLIED MATHEMATICS - PASS

TUESDAY, 29th JUNE—MORNING, 10 to 12.30

Not more than six questions may be answered.
All questions are of equal value.
Mathematical Tables may be obtained from the Superintendent.

1. Explain what is meant by "moment of a force about an axis".
A uniform bar of length 2ft. weighs 6 lb. and rests horizontally on two pegs which are a distance of 6 inches apart. If the reaction at one of the pegs is 4 lbs. weight, find how far the ends of the rod are from this peg.

2. Using the usual notation, prove that $s = ut + \frac{1}{2}ft^2$. (f represents a uniform acceleration).
A particle moves in a straight line with uniform acceleration the initial velocity of the particle being 2 ft. per sec. If the particle travels a distance of 9 ft. in the fourth second of its motion, find its acceleration. Find also the total distance it has travelled when it has acquired a velocity of 6 ft. per sec.

3. State the theorem of the Parallelogram of Forces.
Forces of 7 lb. wt., 5 lb. wt. and 5 lb. wt. act along the sides BA, BC, CA, respectively, of an equilateral triangle ABC of side 1 ft. Find the magnitude and direction of their resultant.
If the line of action of the resultant cuts BC at P and CA at Q, find the length of BP and the length of AQ.

4. Describe briefly an experiment to find the centre of gravity of an irregularly shaped lamina.
Masses of 3 lb., 6 lb. and 5 lb. respectively, are placed at the midpoints of the sides AB, BC, CA of a triangle ABC. If the centre of gravity of these three masses is the same as the centre of gravity of masses 8 lb., 7 lb. and P lb. placed, respectively, at the vertices A, B, C of the triangle, find P.

5. Describe briefly how you could find, approximately, by experiment, the coefficient of friction between the surface of a block of wood and the surface of a table.
A block weighing 8 lb. rests on a rough horizontal table. When it is pulled by a force of 6 lb. wt. in a direction making an angle of 30° with the horizontal, the block is just about to move. Find the coefficient of friction between the block and the table.
If a force of 2 lb. wt. is now added to the 6 lb. wt. force, find the acceleration at which the block begins to move.

6. Show that the work done by a force on a body is equal to the change in the kinetic energy of the body.
A car weighing 2,000 lbs. accelerates uniformly on a horizontal road from a speed of 15 m.p.h. to a speed of 45 m.p.h. in a distance of $\frac{1}{6}$ mile. Calculate the horse-power at which the car is working.

7. Explain the terms "resultant velocity" and "relative velocity". Give an example in each case.
A river $\frac{1}{2}$ mile wide flows at a speed of 2 m.p.h. A man rows his boat so as to cross the river at right angles to the parallel banks. If the man can row at a speed of $2\frac{1}{2}$ m.p.h. in still water, in what direction must the boat be headed and how long does it take him in order to cross ?
If the boat leaves the bank at a point A, what is its velocity
(i) relative to an observer at A, (ii) relative to the flow of the river ?

8. Explain the terms "linear velocity" and "angular velocity".
A wheel turns about its hub (centre) at the rate of 180 revolutions per minute. Calculate its angular velocity in radians per second. If the diameter of the wheel is 14 inches, find the linear velocity of a point on the rim in ft. per sec.

9. State the Principal of Archimedes.
A heavy body weighing 54 grams is partially immersed in a liquid of specific gravity 0·8, 5 c.c. of it being below the surface of the liquid. It is supported by two strings which make angles of 45° and 60°, respectively, with the vertical. Find the tension in each of the strings, correct to the nearest gram weight.
(1 c.c. of water weighs 1 gram.)