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LEAVING CERTIFICATE EXAMINATION, 1934.

PASS.

APPLIED MATHEMATICS.

WEDNESDAY, 20th 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. The following table gives the number of feet, s, travelled by a small sphere in time t seconds when rolling down an inclined plane :

s	·5	2	4·5	8	12·5
t	$\frac{1}{2}$	1	$1\frac{1}{2}$	2	$2\frac{1}{2}$

Draw a graph connecting s and t^2 and hence find the acceleration. Describe very briefly how you would carry out the experiment.

2. The maximum speed of an airship in still air is 100 m.p.h. Find the maximum speed with which it can travel due north if there is a north-east wind blowing at 30 m.p.h.

3. Find in feet per second per second the retardation (supposed constant) of a train whose speed decreases from 60 miles per hour to 30 miles per hour in 1,320 ft. Assuming the retarding forces to remain the same, find how much farther the train moves before coming to rest.

4. A ball is thrown from a height of 4 feet above the ground. It reaches a height of 20 feet above the ground and strikes the ground at a horizontal distance of 64 feet from the point of projection. Find the total time of flight and the speed of projection.

5. Two small scale-pans each weighing 10 grms. are connected by a light, inextensible string passing over a light pulley. A 100 grm. weight is placed in each scale-pan, and on placing an additional weight of 7 grms. in one scale-pan and giving the system a small initial velocity it continues to move uniformly. Find the acceleration and the tension in each portion of the string when a 20 grm. weight is placed in the heavier pan, assuming that the force required to overcome the friction remains the same.

6. The foot of a uniform derrick pole weighing 2 cwts. rests on the ground and the pole carries a weight of 2 tons suspended from its upper extremity. The length of the pole is 24 ft., and is kept in position by a guy rope 30 feet long fastened to the top of the pole and to the ground 12 feet behind the foot of the pole. Find graphically or otherwise the tension in the guy rope.

7. A bent lever ABC has its fulcrum at B, and the arm AB, which is 24″ long, is perpendicular to the arm BC, which is 9″ long. A load of 24 lb. is suspended from C. Find what force making an angle of 30° with AB must be applied at A so that BC may be kept in a horizontal position. Find also the reaction at B. The weight of the lever may be neglected.

8. A triangular roof-truss ABC has a horizontal span of 30 feet, and the angle ABC is 120°, AB and BC being of equal length. The roof-truss is hinged at A and simply supported at C. Equal loads of one ton are suspended from the mid-points of AB and BC. Find (i) the tension in AC and (ii) the reaction at B.

Or,

In a differential pulley-block the diameters of the two upper pulleys are a ins. and b ins. Find the distance moved by the effort, P, in order to raise the load W (supposed to include the lower pulley) one inch, and the effort required to raise that load if we neglect the effort necessary to overcome the friction.

9. The wheels of a four-wheeled truck weighing 16 cwt. are 5 feet apart transversely, and the c.g. is 3 feet high when the truck is on level ground. A load of 2 tons is placed symmetrically on the truck, the c.g. of the load being 5 feet above the ground. Find the height of the c.g. of the loaded truck and to what height may the wheels on one side run up a bank before it is upset.

10. State the principle of conservation of momentum. If a $\frac{1}{2}$-ton gun discharges a 100 lb. shot horizontally with a velocity of 1,000 ft. per second, find the uniform resistance necessary to stop the recoil of the gun in 1 foot.