COURSE IN ELECTRICAL ENGINEERING.

AN RÓINN OIDEACHAIS.
(Department of Education.)

BRAINSE AN CHEARD-OIDEACHAIS.
(Technical Instruction Branch.)

TECHNICAL SCHOOL EXAMINATIONS.
1933.

MATHEMATICS, MECHANICS AND TECHNICAL DRAWING.
(Second Year.)

Tuesday, May 30th—7 to 10 p.m.

Co-Examiner—Peadar A. MacCionnaith, M.Sc., A.C.S.I.

GENERAL INSTRUCTIONS.

You are carefully to enter on the Answer Book and Envelope supplied your Examination Number and the subject of examination, but you are not to write your name on either. No credit will be given for any Answer Book upon which your name is written, or upon which your Examination Number is not written.

You must not have with you any book, notes or scribbling-paper, except the book of logarithms supplied to you.

You are not allowed to write or make any marks upon your paper of questions.

You must not, under any circumstances whatever, speak to or communicate with another candidate; and no explanation of the subject of the examination may be asked for or given.

You must remain seated until your answer-book has been taken up, and then leave the examination-room quietly. You will not be permitted to leave before the expiration of twenty minutes from the beginning of the examination, and will not be re-admitted after having once left the room.

If you break any of these rules, or use any unfair means, you are liable to be dismissed from the examination, and your examination may be cancelled by the Department.

Three hours are allowed for this paper. Answer-books, unless previously given up, will be collected at 10 p.m.
SECTION A.

(Note not more than three of the seven questions to be attempted should be taken from this section).

1. Find the value of

\[(a) \log \frac{B}{A} + \log \frac{A}{C} \]
\[(b) \log \frac{C}{A} - \log \frac{D}{A}\]

when \(B = 4.57\), \(C = 1.39\), and \(D = 5.27\).

2. Estimate the value of

\[24B^{1.3} + 6B^2\]

when \(B = 8.49\), and find the ratio of the first to the second term of the expression.

SECTION B.

(Note not more than two of the seven questions to be attempted should be taken from this section).

7. Make a sketch showing the main features of a screw-jack, and, neglecting friction, derive a formula for the mechanical advantage of the machine. Explain how the force of friction operates in this machine.

8. A train moves off from a station with a uniform acceleration of 2 miles per hour per second. Calculate its speed in miles per hour after 12 seconds, and if the total weight of the train is 110 tons, find its kinetic energy in foot-pounds at the end of the same interval.
9. Explain what is meant by the term *centrifugal force*. The cylindrical rotor of a turbo-alternator is not to be subjected to a greater centrifugal force than 2000 lb. wt. per pound of material. Estimate the largest radius the rotor can have for a speed of 1500 R.P.M.

**SECTION C.**

*(Not more than two of the seven questions to be attempted should be taken from this section).*

10. Draw a free-hand sketch of *either*—

(a) An outline of the field magnet system of a four pole D.C. machine fitted with interpoles when used as (1) a generator, (2) a motor. The directions of the exciting currents, the polarities of the poles, and the direction of rotation should be clearly indicated.

*Or*

(b) A line diagram of a starter suitable for a large D.C. shunt wound motor showing overload and no-volt release devices.

11. On the accompanying sheet is shown a free-hand dimensioned sketch of an enclosed electromagnetic switch with its interior part shown through the surrounding iron shell. Draw to a suitable scale a sectional elevation through AB at right angles to the view shown. The letter *d* in the sketch represents diameter.
Mathematics, Mechanics & Technical Drawing.

(Second Year.)

Ques. 11

[Diagram with dimensions labeled]