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# Electrical Engineering (2nd Year): Technical School Examinations 1933

Department of Education: Technical Instruction Branch

# COURSE IN ELECTRICAL ENGINEERING.

(51.)

**AN ROINN OIDEACHAIS.**
**(Department of Education.)**

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

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TECHNICAL SCHOOL EXAMINATIONS.
**1933.**

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## ELECTRICAL ENGINEERING.
**(Second Year.)**

*Friday, May 26th—7 to 10 p.m.*

*Examiner*—PROFESSOR W. BROWN, B.SC., M.I.E.E.
*Co-Examiner*—J. P. HACKETT, ESQ., B.E., A.R.C.SC.I.

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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.

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.*

INSTRUCTIONS.

*Read the General Instructions on page* 1.

(*a*) Not more than *seven* questions are to be attempted.

(*b*) Equal values are attached to the questions.

(*c*) Answers must be written in *ink*; diagrams may be made in *pencil*.

(*d*) Write the number of the question distinctly in the margin of the paper, before the answer.

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1. Draw a diagrammatic section of a four pole direct current dynamo showing the paths of the lines of magnetic flux in the field-magnet system and armature.

Write down an expression for the total magnetic flux in the system and explain clearly the meaning of each term you use. What part of the magnetic path has the *least* and what part the *greatest* reluctance? Give reasons.

2. Describe briefly the construction of an armature of a d.c. generator, and explain why stalloy or silicon iron is used.

The armature of a six pole generator has a two circuit winding and rotates at 360 r.p.m. Total armature conductors = 420, magnetic flux per pole = $4{\cdot}7 \times 10^6$ lines. Find the E.M.F. generated.

3. What kind of d.c. dynamo would you employ in each of the three following cases:—(1) lighting glow lamps in parallel, (2) lighting arc lamps in series, (3) charging a storage battery.

Give reasons for your answers.

4. Explain clearly why it is necessary to diminish the strength of the magnetic field of a shunt-wound motor, in order to keep the speed constant when the load is increased.

5. What is meant by the *torque* on the armature of a motor?

When a certain motor is taking 50 amperes from the line, it develops a 60 ft.-lb. torque. If the field strength of the motor is reduced to 75 per cent. of its original value and the current increases to 80 amperes, find the new value of the torque.



6. Give a neat diagrammatic sketch of a switch board panel for a d.c. shunt-wound motor, indicating the necessary apparatus for current, pressure, starting the motor and speed regulation.

7. Define the following terms as applied to alternating current circuits:—period, frequency, inductance, impedance and reactance.

Give a neat diagram of a fixed armature and revolving poles to illustrate the action of a simple alternator, and explain how the E.M.F. and current are produced in the armature coils.

8. Explain how the relationship between E.M.F. and current varies in an alternating current circuit when (1) the load is non-inductive, (2) the load is inductive, (3) the circuit contains a capacity. Illustrate your answers by means of vector diagrams

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9. What is meant by "resonance" in an alternating current circuit? Explain under what conditions it may occur in a circuit.

A condenser is put in series with a coil of 10 ohms. resistance and inductance 0.25 henry, and an applied pressure of 100 volts at frequency 50 is put on the circuit. Find the capacity of the condenser to produce resonance.

10. Describe with the help of sketches how a rotating magnetic field is produced in a three phase induction motor. If such a motor were installed so that the direction of rotation was wrong how would you put it right? Explain clearly the reasons.