THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL
CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

082 **ELECTRICAL ENGINEERING SCIENCE**
(For both School and Private Candidates)

TIME: 3 Hours. 12 November 1999 P.M.

INSTRUCTIONS

1. This paper consists of Sections A and B.
2. Answer ALL questions in Section A, and any FOUR (4) questions from Section B.

   Section A carries 40% and Section B carries 60%.
3. Scientific calculators are allowed.

This paper consists of 3 printed pages.

Scanned by CamScanner

SECTION A : (40%)

1. What is meant by the term "resistivity" of a material? Give its SI unit.
2. What are the uses of the following instruments in electrical circuits?
   (a) Ohmmeter
   (b) Ammeter.
3. What are the main losses in transformers?
4. A double-wound transformer has a 240V in the primary winding consisting of 2400 turns. Calculate the "volt per turn".
5. State how eddy-current losses can be reduced in d.c. machines.
6. The frequency of an oscillating quantity is 50Hz. What is the period of oscillation?
7. A conductor 0.5m long carries a current of 25A and lies at right angles to a magnetic field of density 0.25T. Determine the force exerted on the conductor.
8. Explain how the power factor of an inductive load may be improved.
9. Define the term "a time constant" of an RC circuit.
10. What is meant by Polarization in a simple voltaic cell?

SECTION B : (60%)

11. What is the power factor of a coil of resistance 5Ω and inductance 0.1H when connected to a 250V, 50Hz supply? What power will the coil consume under these conditions?
12. A water heater holds 20 litres of water. Calculate the rating in kW of the electric immersion heater which will raise the temperature of the water from 10°C to 88°C in 55 minutes, assuming an efficiency of 85 per cent.

    (The specific heat capacity of water = 4200J/Kg°C)
    (1 litre of water = 1 kg).
13. A load of 19.2kW is supplied from the terminal of a generator at 240V. The shunt winding of the generator has a resistance of 96Ω and the resistance of the armature is 0.2Ω. There is a brush contact volts drop of 2V. Calculate:
    (a) the armature current, and
    (b) the generated e.m.f.
14. (a) A double-wound transformer is used to supply 50V from the 250V mains. The primary winding contains 1500 turns. Find:
    (i) the number of secondary turns and
    (ii) the secondary current when the primary is 5A.

Scanned by CamScanner

(b) The primary winding of a double-wound step-down transformer takes a current of 6A at 2000V. If the transformer ratio is 20:1 , calculate:

(i) the secondary voltage and

(ii) the secondary current.

15. Four Leclanché cells are joined, two in series and two such groups in parallel. The e.m.f. of each cell is 1.5V and internal resistance 3Ω. The combination is connected to an external resistance of 3Ω. Find

(a) the total internal resistance;

(b) the current

(c) the current through each cell; and

(d) the voltage across the external resistance.

16. (a) Define the Inverse Square Law of Illumination.

(b) A fitting designed for a shop window gives a light intensity of 1000 candela downwards. Calculate

(i) the distance required to produce an illumination of 10 lux on a horizontal display counter.

(ii) If the distance is doubled, what must be the power of the source to produce the same illumination?

Scanned by CamScanner