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* *Wednesday afternoon 10/10/2007*

Instructions

1. This paper consists of sections A, B and C.
2. Answer **all** questions in sections A and B and **three (3)** questions from section C.
3. Electronics calculators are **not** allowed in examination room
4. Cellular phones are **not** allowed in examination room.
5. Write your **Examination Number** on every page of your answer booklet(s).

S4S This paper consists of 5 printed pages.

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SECTION A (10 marks)

Answer **all** questions in this section.

1. For each of items (i) – (x) choose the correct answer from among the given alternatives and write its letter beside the item number.

(i) The following material is suitable for making filament of incandescent lamps.

A. Brass
B. Tungsten
C. Argon
D. Copper
E. Mercury

(ii) The unit used to measure luminous intensity is

A. lumen/m^2
B. candela
C. lux
D. lumen
E. candela/m^2.

(iii) Normally a transformer is laminated in order to

A. reduce power factor
B. reduce armature reaction
C. increase power loss
D. reduce eddy current.
E. increase eddy current.

(iv) The instrument that is used to measure both A.C and D.C is known as

A. money iron instrument
B. moving coil instrument
C. clamp meter
D. tacho metre
E current meter.

(v) The type of light source are

A. Discharge and incandescent lamps
B. Generators and incandescent lamps
C. Batteries and incandescent lamps
D. Magnetism and incandescent lamps
E. Batteries and magnetism

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(vi) The extra low voltage for dc supply is

A 30 V
B 50 V
C 240 V
D 10 V
E 25 V

(vii) Usually a rectifier is made by using the following components:

A Transistors
B Capacitors
C Diodes
D Resistors
E Thyristor

(viii) Torque is the turning moment produced by a force about an axis or centre of rotation which is measured by the following unit:

A Nm
B Wb
C W
D m/s
E Wb/m.

(ix) The unit of the relactance, s, of a magnetic circuit is

A V/d
B N/t
C $\frac{\text{m.m.f}}{\text{flux}}$
D V/A
E $\frac{\text{m.m.f}}{\text{t}}$

(x) Which of the following instruments is used for testing high voltage?

A Galvanometer
B Potential meter
C Multimeter
D Voltage transformer
E Voltmeter

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SECTION B (30 marks)

Answer **all** questions in this section.

2. Define the term "armature reaction" of a DC machine

3. Mention the main parts of an AC machine.

4. Calculate the illumination of a working plane at a point G, 4 m vertically below a lamp emitting 800 cd. The surface is at right angles to the light source.

5. Why are transformers rated in KVA?

6. Write down the instruments used to measure the following quantities:
   (a) Illumination
   (b) Resistance
   (c) Electric energy.

7. Explain the meaning of the word "polarization" then mention the instrument used to measure the specific gravity of a battery.

8. The frequency of an oscillating quantity is 60 Hertz. What is the period of oscillation?

9. List down **three (3)** methods which can be used to improve low power factor.

10. Write down **six (6)** methods that are used to generate electricity.

11. Mention **three (3)** types of discharge lamps.

SECTION C (60 marks)

Answer **three (3)** questions from this section.

12. Find the efficiency of water heater which heats 140 litres of water from 10°C to 60°C in 3 hours. The water is heated by a 3 kilowatts element.

13. (a) By using a neat diagram explain how you can extend the range of a voltmeter.
    (b) A moving coil instrument gives a full scale deflection (FSD) with a current of 30 mA and a voltage of 90 mV. Calculate the value of a resistor to be connected with the instrument so that it can be used to read 0 – 100 volts.

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14. The resistance of a shunt winding of dc machine is measured before and after a run of several hours. The average values are $55\,\Omega$ and $63\,\Omega$. Calculate the rise in temperature of the winding. Assume the room temperature of 15°C. (Temperature coefficient of resistance of copper is 0.00428 %/°C

15. Two capacitors A and B of capacitance 2 microfarads and 4 micro farads respectively are connected in series to a dc supply charge stored by each capacitor of 0.16 mC.

Determine the

(a) potential difference across each capacitor

(b) energy stored by each capacitor

(c) effective capacitance of series combination

(d) total energy stored.

16. (a) What is a pure inductive circuit ?

(b) A circuit consists of inductor, capacitor and resistor of 10 ohms, 4 ohms and 8 ohms respectively. If the components are connected in series across 240 volts and 50 Hz, calculate the current of a circuit.

(c) Draw the vectorial (phasor) relationship between voltage and current of the above circuit.

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