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 3rd October 2008 p.m.*

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. Cellular phones are **not** allowed in the examination room.
4. Electronic calculators are not allowed in the examination room.
5. Write your **Examination Number** on every page of your answer booklet(s).

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SECTION A (10 marks)

Answer all questions in this section.

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

(i) Neutron is a particle of an atom with
- A negative charge
- B positive charge
- C no charge
- D negative and positive charges
- E positive ion.

(ii) Which one of the following is a correct conversion?
- A 15 μΩ = 150 mΩ
- B 3.2 mA = 0.0032 A
- C 40 kW = 400 W
- D 250 mV = 25 V
- E 15 kΩ = 150 Ω

(iii) The lowest resistance in an electric circuit is obtained when the resistors are connected in
- A series-parallel circuit
- B series
- C compound
- D parallel
- E parallel series to the load.

(iv) The measuring instrument that is used to measure both a.c. and d.c. electrical quantities is the
- A moving iron type
- B moving coil type
- C galvanometer type
- D metal rectifier type
- E dynamometer type.

(v) Which of the following is the correct formula applied in the calculation of turn ratio of a transformer?

A $\frac{N_2}{N_1} = \frac{V_1}{V_2}$ B $\frac{V_2}{V_1} = \frac{I_2}{I_1}$ C $\frac{N_1}{N_2} = \frac{I_1}{I_2}$

D $\frac{V_1}{V_2} = \frac{I_2}{I_1}$ E $\frac{N_1}{N_2} = \frac{I_2}{I_1}$

(vi) Local action in batteries and cells can be explained as
A the formation of bubbles gas of hydrogen in the carbon electrode (electrode)
B the situation whereby electrolyte attacks the carbon electrode
C the process of sal-ammonia solution attacking the glass container
D the process of electrolyte attacking the impurities in the zinc (-ve electrode)
E charging of zinc plate using carbon plate.

(vii) What will happen to a carbon material when it is exposed to high temperature?
A Its resistance will decrease
B Its resistance will increase
C Its resistance will remain constant
D It will soften
E It will harden

(viii) Which of the following will affect the capacitance of a capacitor?
A Permeativity, number of turns and maximum flux
B Area, number of parallel plates, insulation material and distance between the plates
C Cross-sectional area, resistivity, length and temperature
D Permeability, length and cross-sectional area
E Resistivity, dielectric material, number of plates and cross-sectional area

(ix) The effective value in an a.c. circuit is called
A peak value
B average value
C minimum value
D form factor value
E root mean square value.

(x) Which of the following motors is not recommended to be started without a load?
A Shunt
B Accumulative compound
C Differential compound
D Series
E Squirrel cage

SECTION B (30 marks)
Answer all questions in this section

2. Why is series wound motor known as a universal motor?

3. Give **three (3)** advantages of three phase system over a single phase system.

4. An area 10 m × 2.5 m is to be illuminated to a level of 150 lux. How many lumen must reach the area?

5. Explain the meaning of the word AMPACITY as applied in conductors and cables.

6. A power transformer has 415 V at no load and 405 V at full load. Calculate the voltage regulation.

7. Give **two (2)** differences between moving coil instrument and moving iron instrument.

8. A force on a conductor carrying current of 25 A is 12 N and lies at right angle to a magnetic field density of 1.6 T. Calculate the length of a conductor.

9. Give **three (3)** practical applications of chemical effect of electric current.

10. Deduce the behaviour of current in series and parallel connected loads.

11. Find the internal resistance of a cell having an e.m.f. of 1.8 V, potential difference of 1.2 V and circuit current of 0.6 A.

SECTION C (60 marks)
Answer **three (3)** questions from this section

12. Three coils are connected in delta to a 3-phase 3-wire 415 V, 50 Hz supply. They take line current of 5 A at 0.8 power factor lagging.
Calculate the
(a) resistance of a coils
(b) inductance of a coils

13. (a) What is the difference between motor and generator?
(b) A d.c. shunt generator has an induced e.m.f. of 300 V when the armature current is 80 A and terminal voltage is 274 V. Assuming a brush voltage drop of 2 V, calculate the
(i) armature resistance
(ii) terminal voltage for armature current of 60 A.