THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

082 ELECTRICAL ENGINEERING SCIENCE

Time: 3 Hours **9 November 2001 pm**

Instructions

1. This paper consists of sections A, B and C.
2. Answer ALL questions in sections A and B and FOUR (4) questions from section C.
3. Write your Examination Number on every page of your answer booklet(s).

This paper consists of 4 printed pages.

SECTION A (10 marks)

Answer **ALL** questions in this section.

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

(i) Luminous flux is

A a light source
B illumination
C a candela
D light emitted from the source
E a lux.

(ii) The material commonly used for the manufacture of filaments of electric lamps is

A aluminium B steel C zinc D tungsten E copper

(iii) A rectifier is a circuit used to

A rectify faults in electrical systems
B stabilize voltages in the circuits
C convert A.C. to D.C. quantities
D convert D.C. to A.C. quantities
E allow limited currents to flow in circuits.

(iv) The heaviest particle of an atom is

A a neutron B a nucleus C an electron D a proton E a shell

(v) A transformer has 1920 primary and 96 secondary turns. If the primary voltage is 240 V, the secondary voltage is

A 120 V B 480 V C 12 V D 4800 V E 1200 V.

(vi) Time-constant in an RC circuit is the time taken for the capacitor to charge up to ..... of the supply voltage.

A 63.6 % B 50 % C 70.7 % D 0.707 % E 6.38 %

(vii) Local action in simple cells refers to the formation of

A impurities in the electrolyte
B more positive ions in the electrolyte
C more negative ions in the electrolyte
D tiny cells in the electrolyte
E insulation resistance in the electrolyte.

(viii)

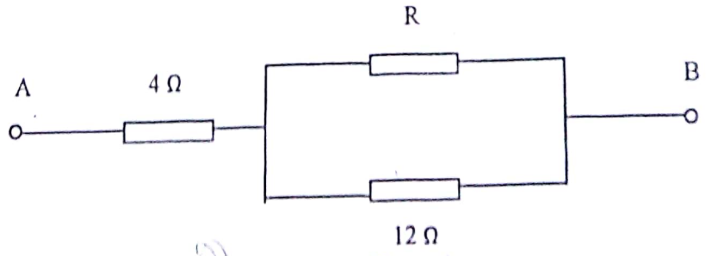

Figure 1

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For the equivalent resistance in figure 1 to be 10 Ω, the value of R should be

A 6 Ω B 2 Ω C 12 Ω D 8 Ω E 14 Ω.

(ix) The energy stored in an indactance of L henry when the current I amperes is flowing through it is given by

A L.I B $\frac{L}{I}$ C $2LI^2$ D $\frac{LI^2}{2}$ E $\frac{L}{2I}$.

(x) The multiple of a Mega is

A 10^{-6} B 10^{9} C 10^{3} D 10^{6} E 10^{-9}

From the

SECTION B (30 marks)

Answer ALL questions in this section.

2. What is electromagnetism?

3. A moving coil instrument gives a full-scale deflection with a p.d. of 70 mV and a current of 20 mA. Calculate the value of shunt required to give a range of 0 - 10 A.

4. The transformation ratio of a transformer is a 6:1. Calculate the secondary voltage when the primary voltage is 415 V.

5. A steady current of 5 A is passed through a copper calorimeter for 20 min. Assuming the electrochemical equivalent of copper is 0.33 mg/C, calculate the mass of copper deposited on the cathode.

6. Name three types of d.c. generators.

7. What will the line voltage and line current be if the phase voltage and current are 230 V and 15 A respectively in a star-connected system?

8. What factors determine the resistance of metallic conductors?

9. Define the following terms as applied to circuits:

   (a) Period (b) Frequency (c) Maximum value

10. List the quantities that are measured in Newtons, Joules and Watts.

11. A capacitor of 200 micro-farads is connected across a 100 V – supply. Calculate the charge and the energy stored.

SECTION C (60 marks)

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

12. Use Kirchhoff's laws to calculate the current through the 10 Ω resistor in figure 1.

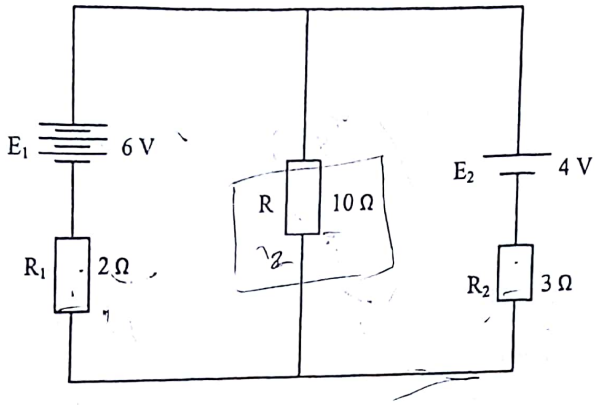

Figure 1

13. A circuit consists of two groups of resistors. Group A consists of three resistors of 6 Ω, 4Ω and 12 Ω connected in parallel. Group B consists of two resistors of 6 Ω and 12 Ω connected in parallel. Group A and B are connected in series and a supply of 36 V is applied across the combination. Find
(a) the power used in the complete circuit
(b) the power in the 4 Ω resistor.

14. An 8-pole d.c. shunt generator with 778 wave-connected armature conductors and running at 500 r.p.m. supplies a load of 12.5 Ω at a terminal voltage of 50 V. The armature resistance is 0.24 Ω and field resistance is 250 Ω. Find the armature current, the induced e.m.f. and the flux per pole.

15. A coil of resistance 3 Ω and inductance 0.08 H is connected to a supply of 240 V, 50 Hz. Calculate
(a) the current in the circuit,
(b) the value of a capacitor to be put in series with the coil so that the current shall be 12 A.

16. A domestic water-heater of 8 litres capacity is rated at 750 W. Assuming an overall efficiency of 94 per cent, calculate the time required to raise the temperature of water from 30° C to 94.5° C. (Take the specific heat capacity of water as 4200 J/kg K. 1 litre is equal to a mass of 1 kg of water).