

Candidate's Examination Number

SMZ

ZANZIBAR EXAMINATIONS COUNCIL

FORM THREE ENTRANCE EXAMINATION

053

ELECTRICAL ENGINEERING SCIENCE

TIME: 2:30 HOURS

WEDNESDAY 30TH DECEMBER 2020 A.M

INSTRUCTIONS TO CANDIDATES

1. This paper consists of **THREE** (3) sections A, B and C.
2. Answer **ALL** questions in this paper.
3. Write your examination number on every page of this booklet.
4. Write all answers in the space provided.
5. Use a blue or black pen in writing. Diagrams must be in pencil.
6. Calculators, cellular phones and unauthorized materials are not allowed in the examination room.

FOR EXAMINER'S USE ONLY					
Question number	Marks	Signature	Question number	Marks	Signatur
1			8		
2			9		
3			10		
4			11		
5			12		
6			13		
7					
TOTAL					

This paper consists of 12 printed pages

SECTION A: (10 Marks)

Attempt ALL questions from this section.

1. Choose the correct answer and write its letter in the table provided below.
 - i) A transformer has 800 primary turns and 100 secondary turns. To obtain 40V from the secondary winding, the voltage to be applied at the primary winding must be
A: 5V B: 320V C: 2.5V D: 20V E: 50V
 - ii) The magnitude of induced e.m.f in the conductor is determined by
A: the amount of flux cut
B: amount of the flux linkage
C: rate of flux linkage
D: flux density of the magnetic field
E: change of magnetic flux
 - iii) The direction of induced emf can be found with the help of
A: lens's law
B: Fleming right hand rule
C: kirchoffs voltage law
D: Laplace's law
E: Kirchhoff's current law
 - iv) The rate of rise of current through an inductive coil is maximum
A: after one time constant
B: at the start of current flow
C: near the final maximum value of current
D: at 63.2% of its maximum steady value
E: at constant movement

- v) During the charging of lead acid cell
 A: its cathode become dark chocolate brown in color
 B: the voltage increases C: It give out energy
 D: Specific gravity of H_2SO_4 decreases E: It falls the current flow
- vi) Trickle charging of a storage battery helps to
 A: prevent palpation B: keep it fresh and fully charged
 C: maintains proper electrolyte level D: increases its reserve capacity
 E: increases oxygen
- vii) KWh meter can be classified as an
 A: deflecting instrument B: digital instrument
 C: recording instrument D: indicating instrument
 E: stationary instrument
- viii) The flow of current in solids is due to
 A: electrons B: atoms C: electrons and ions
 D: protons E: neutrons and protons
- ix) An electron has ----- charge
 A: negative B: positive C: neutral
 D: no E: positive and negative
- x) If two 4Ω resistors are connected in series the effective resistors of the circuit is
 A: 8Ω B: 4Ω C: 2Ω D: 1Ω E: 5Ω

Answer

i	ii	iii	iv	v	vi	vii	viii	ix	x

SECTION B: (45 Marks)

Attempt ALL questions from this section.

2. a) List down any two (2) factors that determine the resistance of the material.

- b) Show that the Total resistance of resistors R1 and R2 in parallel is given by

$$R_t = \frac{R_1 \times R_2}{R_1 + R_2}$$

3. a) Define the term specific heat capacity.

- b) A sample of copper has a resistance of 10Ω at 0°C . What will be its resistance at 50°C ? Assuming that the temperature coefficient of copper is 0.004Ω per $^\circ\text{C}$

4. a) Distinguish between step up transformer and step down transformer.

- b) State the basic transformer equation.

5. a) Name three (3) essential devices for all analogue electrical indicating instruments.

- b) With typical examples, distinguish between conductor and insulator.

6. a) A 100W electric lighting bulb is supplied from 250V.

- i) Determine the current flowing in the bulb.
- ii) Calculate the resistance of the bulb.

b) How many Ohms are there in $0.45\text{M}\Omega$?

7. An electric heater consume 3.6MJ when connected to a 250V supply for 40minutes. Find

- a) the power rating of the heater
b) the current taken from the supply

8. a) Distinguish between Potential difference (p.d) and Electromotive force (E.m.f).

- b) Draw the symbol for each of the following instruments.

i) Ohmmeter

ii) Wattmeter

9. a) List down any two (2) examples of dielectric materials.

- b) Distinguish between capacitor and capacitance.

- c) Write down any two (2) examples of capacitor.

10. a) Define the following terms.

i) Magnetic field

ii) Magnetic flux density

b) State the basic law of magnetism.

SECTION C: (45 Marks)

Attempt ALL questions from this section.

11. a) State Ohm's law.

b) A 15Ω and 5Ω resistors are connected across 37.5V supply. Find

i) Total resistance

(ii) Total circuit current

iii) Current flowing through each resistor

iv) Potential difference across each resistor

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- [illegible]

12. a) Define the term specific heat capacity of a substance.

- b) The temperature of 5kg block of copper rises from 15°C to 30°C on being heated. Determine the amount of heat energy supplied to the block.
Specific heat capacity of copper is $390\text{J/Kg}^{\circ}\text{C}$

- c) i) Calculate the current taken by 3KW appliance when connected to 240V supply.

- ii) Show that the current will be reduced to 10.41A if the appliance is incorrectly connected to 200V supply, assuming the resistance of the appliance remains the same.

13. a) Draw a circuit consisting of capacitor C_1 and capacitor C_2 in parallel , the combination is connected in series to a capacitor C_3 . The circuit is supplied from 5V dc.

b) Express

i) 0.456 pF in to Farad

ii) 45 μ F in to Farad.

- c) Capacitors of 3 μ F and 5 μ F are connected in series to a 240V supply.

Calculate

i) The resultant capacitance

(ii) The charge on each capacitor

iii) P.d across each capacitor

(iv) Energy stored in each capacitor

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