THE UNINTED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION AND CULTURE

FORM TWO SECONDARY EDUCATION EXAMINATION, 1993

0081 ELECTRICAL INSTALLATION

Time: 2:30 Hours **ANSWERS** **.**

Instructios:

1. this paper consists of 25 questions.
2. answer all questions.
3. All answers must be written in spaces provided.

1. An auto-transformer works on the principle of:
A. Self induction
B. Mutual induction
C. Electromagnetism
D. Lenz's Law
Answer: A. Self induction
Explanation: An auto-transformer operates on self-induction, where a single winding provides both primary and secondary windings.

2. Effects of an electric current are:
A. Chemical, heating, and frictional
B. Current, voltage, and resistance
C. Chemical, heating, and magnetic
D. Heating, frictional, and magnetic
Answer: C. Chemical, heating, and magnetic
Explanation: Electric current results in chemical effects (e.g., electrolysis), heating effects (e.g., heaters), and magnetic effects (e.g., electromagnets).

3. If a wire is heated, its resistance:
A. Gets larger
B. Gets smaller
C. Remains the same
D. Becomes infinite
Answer: A. Gets larger
Explanation: The resistance of a wire increases with temperature as atoms vibrate more, causing more collisions with electrons.

4. An a.c. wave being modulated is called:
A. A signal
B. A carrier
C. An amplitude modulated wave
D. Frequency
Answer: C. An amplitude modulated wave
Explanation: In amplitude modulation, the amplitude of the carrier wave varies according to the modulating signal.

5. The lamps in a household circuit are connected:
A. In series
B. In parallel
C. In series-parallel
D. Sometimes in series, sometimes in parallel
Answer: B. In parallel

Explanation: Parallel connections ensure that each lamp operates independently, with the same voltage across each.

6. Name the instruments used to carry out the following tests:
(a) To measure the flow of current: Ammeter
(b) To measure the emf and p.d.: Voltmeter

7. The requirements of IEE Regulations concerning any joint of a conductor carrying current are:
Answer: Any joint must be mechanically sound and electrically efficient.

8. A 100W, 250V filament lamp connected in a sub-circuit will pass a current of:
Answer: Using I = P / V:
I = 100 / 250 = 0.4 A.
Explanation: The lamp will draw a current of 0.4 A when switched on.

9. TANESCO uses two major sources of power in generating electricity. These are:
(a) Hydroelectric power
(b) Thermal power
Explanation: Hydroelectric power uses water, while thermal power uses fossil fuels to generate electricity.

10. An ohmmeter is used to measure the resistance of a conductor, but another way which can be used to find the resistance is:
Answer: By using Ohm's Law (R = V / I), where resistance is calculated using voltage and current.

11. State the maximum permissible voltage drop when lighting circuits operate at the following voltages:
(a) 200V: 4% of the supply voltage
(b) 240V: 4% of the supply voltage
Explanation: Voltage drop should not exceed 4% of the supply voltage to ensure efficiency.

12. What is the difference between two-way switching and intermediate switching?
Answer:
- Two-way switching allows control of a light from two locations.
- Intermediate switching allows control of a light from three or more locations.

13. A resistor with a brown body, red tip, and yellow spot would be related to:
Answer: Brown = 1, Red = 2, Yellow = multiplier (10^4).
Resistance = $12 \times 10^4 = 120{,}000\ \Omega$ or $120\ k\Omega$.

14. What is the difference between hydroelectric power and an oil-fired power plant?
Answer:
- Hydroelectric power uses water, a renewable and clean energy source.
- Oil-fired plants burn fossil fuels, causing pollution and relying on non-renewable resources.

15. Name two types of instruments used for measuring electrical quantities:
Answer:
(a) Ammeter for measuring current.
(b) Voltmeter for measuring voltage.

16. Mention two common conductors used in electrical cables:
Answer:
(a) Copper for its high conductivity.
(b) Aluminum for its lightweight and cost-effectiveness.

17. What is frequency?
Answer: Frequency is the number of wave cycles that pass a given point per second, measured in hertz (Hz).

18. Name three main parts of a cable:
Answer:
(a) Conductor to carry current.
(b) Insulation to prevent current leakage.
(c) Sheath for protection from damage.

19. State the three terms used in fuse calculations:
Answer:
(a) Current rating: Maximum current the fuse can carry without blowing.
(b) Voltage rating: Maximum voltage the fuse can withstand.
(c) Breaking capacity: Maximum current the fuse can interrupt safely.

20. In connection with the IEE Regulations, what is the recommended space factor for:
(a) Trunking: 45%
(b) Conduit: 40%
(c) Duct: 30%

21. (a) What is the purpose of lamination in the transformer core?
Answer:
The purpose of lamination in the transformer core is to reduce eddy current losses. Laminating the core into thin sheets insulated from each other minimizes the circular currents that cause energy loss.

(b) types of lamination cores of transformers.
Answer:

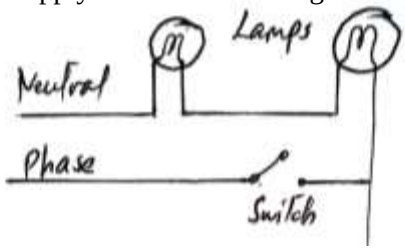
- E-I core: The core is shaped like an E and I, assembled alternately.
- Toroidal core: The core is circular and wrapped with the winding around its circumference.

22. the sequence of supply control in a domestic installation and clearly show the supply authority's equipment and consumer's equipment.

Answer:
The block includes:
1. Supply authority's equipment:
  - Metering unit
  - Main fuse
2. Consumer's equipment:
  - Main switch
  - Distribution board
  - Circuit breakers

23. A single-core cable has the resistance of 0.5 ohms and a cross-sectional area of 2.5 mm², the material used for that cable being a copper conductor whose resistivity is 1.78 micro-ohm-cm. What is the length of the cable?
Answer:
Using the formula:
$R = \rho \times L / A$
Where:
$R = 0.5\ \Omega$
$\rho = 1.78 \times 10^{-6}\ \Omega\text{-cm} = 1.78 \times 10^{-8}\ \Omega\text{-m}$
$A = 2.5\ \text{mm}^2 = 2.5 \times 10^{-6}\ \text{m}^2$
$L = R \times A / \rho$
$L = (0.5 \times 2.5 \times 10^{-6}) / (1.78 \times 10^{-8})$
$L = 1.25 \times 10^{-6} / 1.78 \times 10^{-8}$
$L = 70.22\ \text{m}$

24. Draw a circuit diagram (or wiring diagram) to show how one-way switch can control two lamps.
Answer: The circuit diagram shows the power supply connected to a single one-way switch, which then connects to two parallel-connected lamps.



25. Draw a circuit diagram (or wiring diagram) of one lamp controlled by two two-way switches.
Answer: This is a staircase wiring configuration where two two-way switches are connected to a single lamp. The switches are connected using two traveler wires, and the lamp is controlled from both switches.