

(8 pages)

Reg. No. :

Code No. : 20610 E Sub. Code : ESPH 31

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2025.

Third Semester

Physics

Skill Enhancement Course — MAINTENANCE OF
ELECTRICAL APPLICATION

(For those who joined in July 2023 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. When two resistors of $10\text{ k}\Omega$ and $20\text{ k}\Omega$ are connected in parallel, the effective resistance is equal to _____ $\text{k}\Omega$.
- (a) 27.78 (b) 30
(c) 13.34 (d) 6.67

2. The energy stored in a capacitor can be expressed as _____

- (a) $\frac{Q}{2C}$ (b) $\frac{CV^2}{2Q}$
(c) $\frac{QV}{2}$ (d) $\frac{QV}{2C}$

3. What is the primary material used in the construction of light-emitting diode (LED) in LED lamps?

- (a) Silicon
(b) Germanium
(c) Gallium arsenide
(d) Copper

4. Which of the following technologies is commonly used in water purifiers to remove dissolved salts and impurities?

- (a) Ultraviolet (UV) purification
(b) Reverse Osmosis (RO)
(c) Activated carbon filtration
(d) Chlorination

5. Which component in a microwave oven generates the microwaves?
- (a) Transformer (b) Magnetron
(c) Capacitor (d) Wave guide
6. What determines the power required by a water pumping motor?
- (a) The temperature of the water
(b) The volume of water being pumped
(c) The height to which the water is being lifted and the flow rate
(d) The chemical composition of the water
7. What is the role of the thermostat in an electric iron?
- (a) To distribute heat evenly across the soleplate
(b) To convert electrical energy into heat
(c) To regulate the temperature by switching the heating element on and off
(d) To maintain constant pressure on the fabric

8. Which material is commonly used for the heating element in an electric kettle?
- (a) Copper (b) Aluminum
(c) Nichrome (d) Steel
9. How does an ELCB detect earth leakage?
- (a) By measuring the current in the live and neutral conductors and detecting any imbalance
(b) By measuring the resistance of the earth connection
(c) By detecting high temperatures in the circuit
(d) By measuring the voltage difference between live and neutral conductors
10. Which of the following is a typical application of a relay?
- (a) Amplifying audio signals
(b) Regulating voltage in a power supply
(c) Switching between different power sources
(d) Storing electrical energy

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Derive the expression for effective resistance when resistors are connected in series.

Or

- (b) Discuss in detail the color coding of resistance.

12. (a) Explain the working principle of LED lamps.

Or

- (b) Explain the working principles of a mixie (blender). Discuss the role of its main components, including the motor, blades, and jar, in its operation.

13. (a) Write in detail the various parts of a water heater.

Or

- (b) Using block diagram, describe the operational principles of an electric water heater.

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14. (a) Analyze the advantages of induction cooking compared to traditional cooking methods and discuss the factors affecting the efficiency of an induction cooker.

Or

- (b) Explain the working principle of an electric kettle.

15. (a) Discuss the factors that determine the appropriate fuse rating for a given application.

Or

- (b) Describe the principle of ground fault protection in electrical systems.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Discuss in detail the of resistance.

Or

- (b) Derive the expression for effective capacitance when capacitors are connected in series and in parallel network.

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17. (a) Write about the maintenance of Electric BLUB.

Or

- (b) Explain the working principle of an electric iron box. Detail the factors that influence the efficiency of the iron in removing wrinkles from fabric.
18. (a) Explain the working principles of an air conditioner using a block diagram.

Or

- (b) Give the principle, construction and working of an electric fan.
19. (a) Describe the operation of an automatic rice cooker, highlighting the key components involved in its functionality.

Or

- (b) Using a block diagram, describe the working principles of a hair dryer.

20. (a) Explain the working principles of a Residual Current Circuit Breaker (RCCB). Using a block diagram, describe the main components of an RCCB.

Or

- (b) Explain the working principle of an electromechanical relay. Discuss the advantages of using relays in electrical systems and the factors that can affect their performance and reliability.