

Advanced Electrical Engineering Fundamentals

Electrical Engineering · Answer Key · 25 Questions

1. What is the primary physical phenomenon described by the Poynting vector in an electromagnetic field?

- A) The rate of energy flow per unit area**
- B) The magnetic flux density
- C) The instantaneous electric charge density
- D) The divergence of the current density

2. In a three-phase induction motor, what is the 'slip' defined as when the rotor speed is equal to the synchronous speed?

- A) 0**
- B) 0.5
- C) 1
- D) Infinity

3. Which material property describes the ability of a material to allow the formation of magnetic lines of flux within itself?

- A) Permittivity
- B) Permeability**
- C) Susceptibility
- D) Reluctance

4. What is the unit of measurement for electrical conductance?

- A) Henry
- B) Siemens**
- C) Weber
- D) Farad

5. In the context of transmission lines, what does the term 'characteristic impedance' primarily depend on?

- A) The length of the line
- B) The frequency of the signal
- C) The geometry and dielectric properties of the cable**
- D) The load connected to the end of the line

6. Which law states that the algebraic sum of currents meeting at a junction in an electrical circuit is zero?

A) Kirchhoff's Current Law

B) Ohm's Law

C) Lenz's Law

D) Faraday's Law

7. Which semiconductor device is characterized by a gate terminal that controls the flow of current between a source and a drain?

A) Bipolar Junction Transistor

B) Field Effect Transistor

C) Tunnel Diode

D) Schottky Diode

8. What is the primary purpose of a 'crowbar circuit' in power supply protection?

A) To filter high-frequency noise

B) To short the output to ground to prevent overvoltage

C) To increase the current capacity

D) To step down the AC voltage

9. In an AC circuit, what is the relationship between real power (P), reactive power (Q), and apparent power (S)?

A) $S = P + Q$

B) $S^2 = P^2 + Q^2$

C) $P = S + Q$

D) $Q = S + P$

10. Which parameter of a bipolar junction transistor represents the ratio of collector current to base current?

A) Alpha

B) Beta

C) Gamma

D) Delta

11. What does the 'skin effect' in high-frequency conductors cause?

A) Increased resistance due to current crowding near the surface

B) Decreased capacitance

C) Increased velocity of propagation

D) Total reflection of the signal

12. Which theorem states that any linear electrical network containing only voltage sources, current sources, and resistors can be replaced by an equivalent voltage source and a series resistor?

- A) Norton's Theorem
- B) Thevenin's Theorem**
- C) Superposition Theorem
- D) Maximum Power Transfer Theorem

13. What is the primary function of a commutator in a DC machine?

- A) To regulate the input voltage
- B) To convert AC to DC or vice-versa within the armature**
- C) To decrease the magnetic flux density
- D) To amplify the output current

14. What is the unit of magnetic flux?

- A) Tesla
- B) Weber**
- C) Gauss
- D) Maxwell

15. In power systems, what is the term used to describe the ratio of the average load to the maximum demand over a period of time?

- A) Load factor**
- B) Diversity factor
- C) Demand factor
- D) Utilization factor

16. Which device is specifically designed to store energy in a magnetic field?

- A) Capacitor
- B) Inductor**
- C) Resistor
- D) Transistor

17. What is the name of the phenomenon where a change in magnetic flux through a loop induces an electromotive force?

- A) Faraday's Law of Induction**
- B) Ampere's Law
- C) Coulomb's Law
- D) Gauss's Law

18. What is the SI unit for electric flux density?

A) Coulombs per square meter

B) Volts per meter

C) Amperes per meter

D) Farads per meter

19. Which type of filter is designed to pass signals with a frequency higher than a certain cutoff frequency?

A) Low-pass filter

B) High-pass filter

C) Band-pass filter

D) Band-stop filter

20. What is the 'knee voltage' of a standard silicon PN junction diode approximately?

A) 0.3 V

B) 0.7 V

C) 1.2 V

D) 2.0 V

21. What defines the 'Q factor' of a resonant circuit?

A) Ratio of power dissipated to power stored

B) Ratio of energy stored to energy dissipated per cycle

C) The total impedance of the circuit

D) The bandwidth of the resonance

22. In a three-phase system, what is the phase difference between the voltages in the three phases?

A) 90 degrees

B) 120 degrees

C) 180 degrees

D) 360 degrees

23. Which component is used to transform AC voltage levels in power distribution?

A) Rectifier

B) Inverter

C) Transformer

D) Cycloconverter

24. What is the term for the maximum reverse voltage that a diode can withstand before it breaks down?

- A) Forward voltage
- B) Threshold voltage
- C) Peak Inverse Voltage**
- D) Saturation voltage

25. Which of the following is a non-ohmic device?

- A) Copper wire
- B) Resistor
- C) Semiconductor diode**
- D) Carbon resistor