

## 10. REVIEW QUESTIONS

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1. State Faraday's law in your own words and in a way that makes sense to you.
2. Why is Faraday's law important? What does it add to what we already know from magnetostatics and electrostatics?
3. Define magnetic flux. What are the conditions for a flux to exist?
4. What is the difference between emf and voltage?
5. A changing flux produces an emf. Can an emf produce a changing flux? Under what conditions?
6. State Lenz's law in your own words.
7. Is Lenz's law a separate law or is it included in Faraday's law? Explain.
8. Motional emf is generated due to electric forces on moving charges  $T/F$ .
9. What are the parameters that define motional emf?
10. Is it necessary to apply a force to produce an emf? (Mark correct answer.)
  - (a) Yes, always,
  - (b) No, never.
  - (c) Yes but only if the emf is in a circuit and produces a current.
11. A force applied to a conductor in a magnetic field produces an emf in the conductor. Is the opposite also true? Explain.
12. An emf connected in a circuit produces a current in the circuit. A force must then be applied to maintain this emf. Why is this force necessary?
13. State the difference between a generator and a motor.
14. Can a generator be converted into a motor and vice versa? State the conditions for doing so.
15. If a bar moves back and forth in a magnetic field at constant velocity and changes directions instantaneously, the output emf (or current) is (mark correct answer):
  - (a) Constant.
  - (b) Sinusoidal,
  - (c) Square wave,
  - (d) Triangular wave.
16. What is transformer action? How does it differ from motion action?
17. Both transformer and motion actions produce an emf. Is there any difference between the two? Explain.
18. A linear generator can produce a dc emf only if the motion is constant and in the same direction. Can this be accomplished in a practical device? Explain and sketch.
19. Induced emf can be either dc or ac depending on the arrangement  $T/F$ . Explain
20. Induced emf in a rotating machine is always ac unless rectified by external means  $T/F$ .
21. A bar of length  $L$  rotates in a magnetic field at angular velocity  $\omega$ , in the plane perpendicular to the magnetic field. What is the induced emf?
  - (a) If the bar rotates about its middle and the emf is measured between its ends.

- (b) Same as (a) but the emf is measured between center and one end.
  - (c) If the bar rotates about one end and the emf measured between the two ends.
22. A rotating coil in a constant (dc) field produces (mark all that apply):
- (a) A dc field,
  - (b) An ac field at the frequency of rotation,
  - (c) An ac field at twice the frequency of rotation.
  - (d) An ac field at half the frequency of rotation.
23. Which type of generator is easier to build?
- (a) A dc generator.
  - (b) An ac generator.
- Explain.
24. Any generator requires a given magnetic field to produce an emf. One way of obtaining the required magnetic field is a permanent magnet. In a car alternator there are no magnets but there is always a battery available. How do you suppose the alternator works? Note. An alternator is an ac generator.
25. A small portable generator can be started by pulling on a cord to start the engine and supplies ac current directly to an installation. What can you conclude about this generator in terms of its excitation?
26. In large power plant generators the machines are rotated by water, steam, or an internal combustion engine. How do you suppose is the required magnetic field excited?
27. What is a transformer?
28. Why are most transformers analyzed as ideal transformers? Explain.
29. What is the main difference between real and ideal transformers?
30. Explain what is the coupling coefficient in a general transformer.
31. What is the coupling coefficient for a real transformer in which there is no flux leakage?
32. Are there any fundamental differences between current and voltage transformers? Explain.
33. A closed magnetic circuit in a transformer is necessary for (mark correct answer):
- (a) Induced emf to exist.
  - (b) For operation of the transformer.
  - (c) For efficient operation.
34. Transformers must have (mark all that apply):
- (a) Infinite permeability.
  - (b) Two or more coils.
  - (c) A closed magnetic path.
  - (d) All coils must carry a current.
35. The flux in a finite permeability transformer in which there are no losses and no flux leakage is zero if the secondary supplies the same power as the primary.  $T/F$ .

- 36.** Power transmission relies mainly on ac. dc transmission can also be used. Which method is more advantageous for:
- (a)** Very long distances high voltage transmission if there is no need to convert voltages.
  - (b)** Normal length lines, high voltage, no voltage conversion.
  - (c)** Short distance lines, with need for voltage conversion.
  - (d)** Long distances, with voltage conversion.
- 37.** Eddy (induced) currents in conducting materials are a direct consequence of Lenz's law. *T/F*.
- 38.** Eddy currents can be viewed as the mechanism that produces the opposing field in Lenz's law. Explain.
- 39.** Is the induced emf conservative? Explain.