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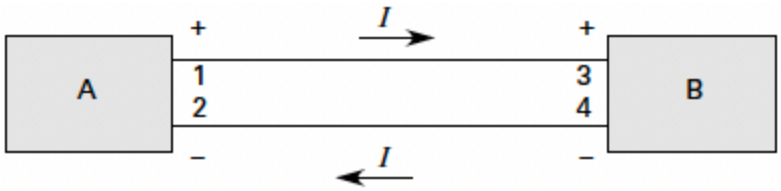
Continuing Education Course #628
Motors/Generators and the NEC:
Course I: DC Rotating Machinery

1. Consider the illustration shown.

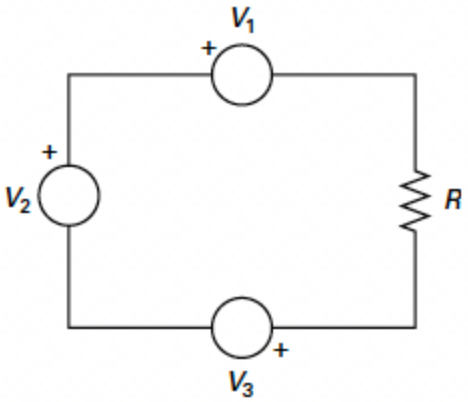


The type of current shown is called _____ current and black box ____ is the load.

- a. conventional / A
- b. conventional / B
- c. electron flow / A
- d. electron flow / B

2. In the following circuit, the voltages use the single subscript notation and have the following values.

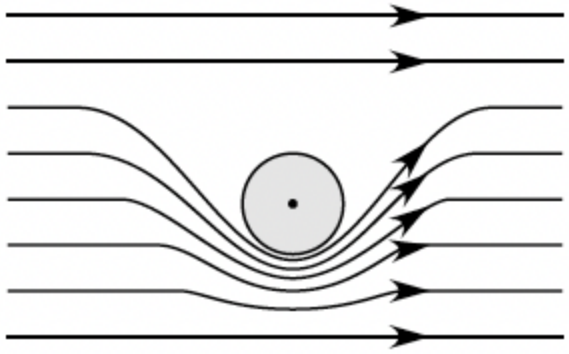
V_1 = -20 V
V_2 = -5 V
V_3 = +15 V



What is the actual polarity of the voltages?

- a. 0 V
- b. 5 V
- c. 15 V
- d. 35 V

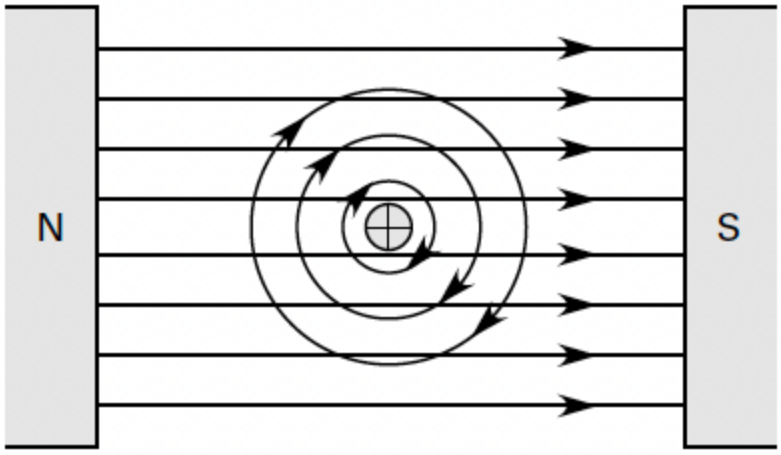
3. A conductor, a magnetic field, and relative motion are required to generate a voltage. In the illustration shown, a conductor is moved through a magnetic field.



What direction of motion is required for the conductor to generate the voltage that results in the current moving out of the paper as shown?

- ○ a. down
- ○ b. left
- ○ c. right
- ○ d. up

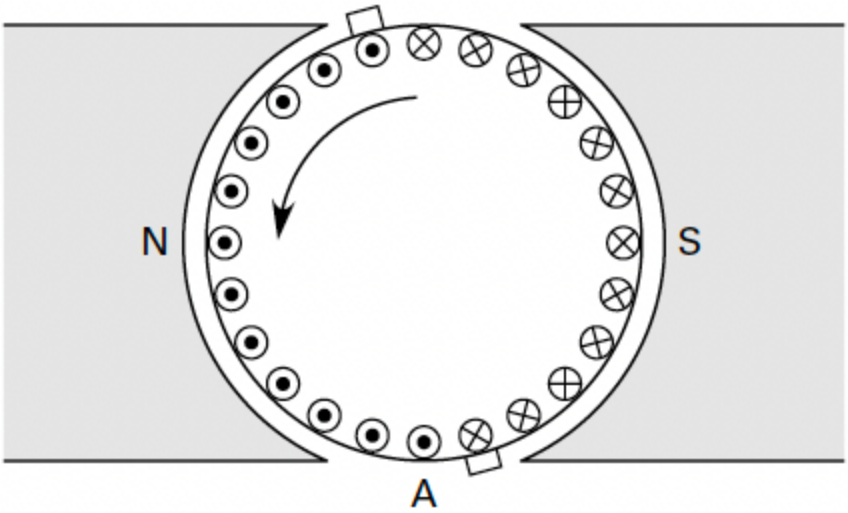
4. A conductor, a magnetic field, and a current on the conductor are required to generate a force. In the illustration shown, a conductor has a current applied into the paper, resulting in two magnetic fields.



What direction of force on the conductor results from the direction of the current and the direction of each of the magnetic fields?

- ○ a. down
- ○ b. left
- ○ c. right
- ○ d. up

5. A DC machine is shown with the direction of motion of the machine and the direction of the current. The velocity of the current is out of the paper, with the magnetic field to the right.



What type of machine is shown?

- a. generator
- b. motor
- c. either a generator or motor
- d. not enough information

6. A large generator has 2.4 m long conductors operating at right angle to a 0.6 T magnetic field moving at 100 m/s.

What is the voltage induced in each conductor?

- a. 12 V
- b. 24 V
- c. 80 V
- d. 120 V

7. What is the approximate voltage for an ignitor given the following data?

Coil Turns: 700
Permanent Magnet Initial Flux, ϕ_0, inside Coil: 5 mWb
Permanent Magnet Final Flux, ϕ_f, inside Coil: 2 mWb
Time for Magnet to move from Initial to Final Position: 0.1 s

- a. 14 V
- b. 21 V
- c. 35 V
- d. 2100 V

8. Nearly all AC generators are of the _____ field type.

- a. permanent magnet
- b. revolving
- c. stationary
- d. none of the above

9. Where does rectification take place on most DC generators?

- a. on rotating field
- b. on rotating portion
- c. on stationary portion
- d. on stationary field

10. What term describes the area perpendicular to the net magnetic field?
- a. armature field
- b. neutral plane
- c. roto field
- d. stator field

11. What direction does the neutral plane shift in a motor?
- a. in the direction of the armature field
- b. in the direction of motion
- c. in the direction of the stator field
- d. opposite the direction of motion

12. What method for correcting the effects of armature reaction uses movable brushes?
- a. commutating poles
- b. compensating windings
- c. modified pole pieces
- d. parallel armature windings

13. Generator action requires a conductor, a magnetic field and _____.
- a. current
- b. relative motion
- c. torque
- d. voltage

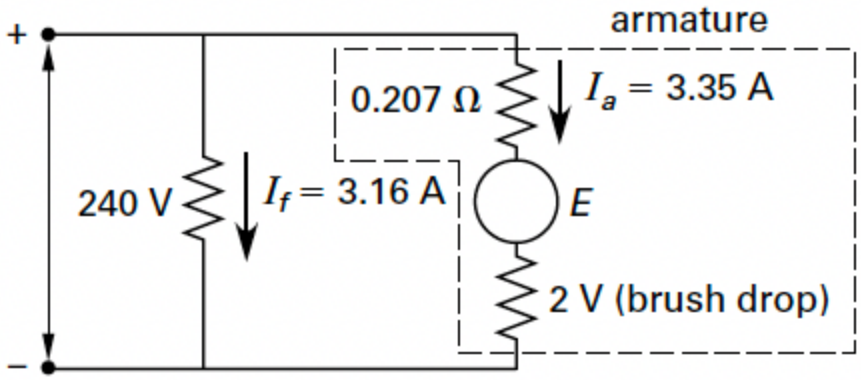
14. What torque [ft-lbf] is developed by a 200 hp motor operating at 300 rpm?
- a. 11.42 ft-lbf
- b. 1050 ft-lbf
- c. 3501 ft-lbf
- d. 5252 ft-lbf

15. The service factor for a given motor is 1.15. The motor itself is rated for 200 hp.

What load can the motor carry without exceeding the temperature rise limits?
- a. 200 hp
- b. 203 hp
- c. 215 hp
- d. 230 hp

16. What NEMA classification allows for a temperature rise to 266°F?
- a. Class A
- b. Class B
- c. Class F
- d. Class H

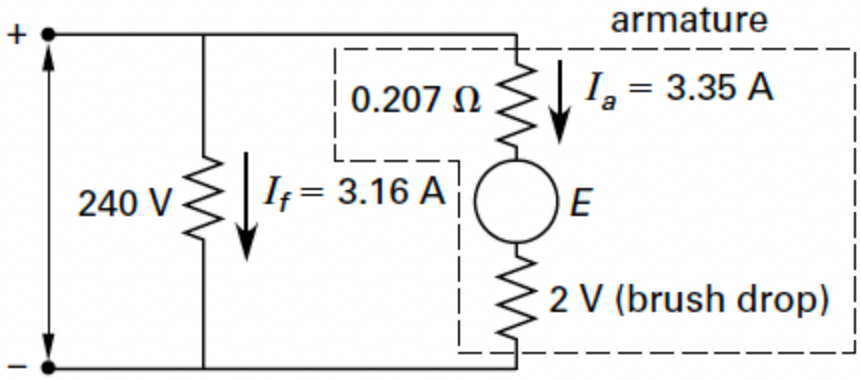
17. The nameplate of a 240 V DC motor states that the full-load line current is 67 A. During a no-load test at rated voltage, 3.35 A armature current and 3.16 A field current are drawn. The no-load armature resistance is 0.207 Ω. The no-load brush drop is 2 V.



What is the no-load power input to the armature?

- a. 2.3 W
- b. 402 W
- c. 480 W
- d. 804 W

18. The nameplate of a 240 V DC motor states that the full-load line current is 67 A. During a no-load test at rated voltage, 3.35 A armature current and 3.16 A field current are drawn. The no-load armature resistance is 0.207 Ω. The no-load brush drop is 2 V.



What most nearly are the copper losses in the armature (ignore the brush loss)?

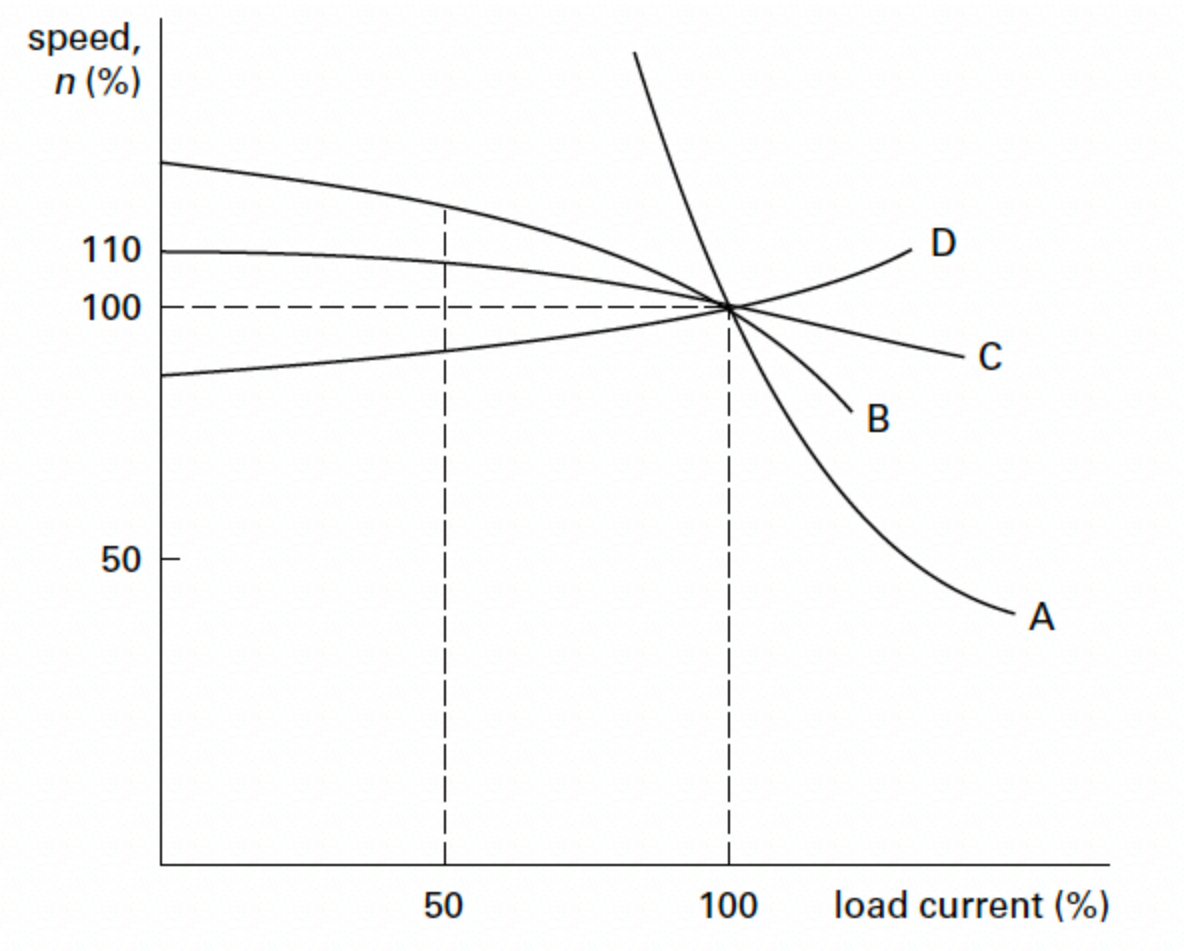
- a. 0.69 W
- b. 2.3 W
- c. 6.7 W
- d. 804 W

19. A two-pole DC generator with a lap-wound armature is turned at 900 rpm. There are 100 conductors between the brushes. The average magnetic flux density in the air gap between the pole faces and armature is 1.0 T. The pole faces have an area of 0.05 m².

What is the no-load terminal voltage?

- a. 75 V
- b. 108 V
- c. 150 V
- d. 240 V

20. In the figure shown, which line represents the characteristics of a series motor?



- a. A
- b. B
- c. C
- d. D