

Exercise I: variable current

Determine the model of Thevenin seen A and B and deduce the model of Norton

$$E = 100, Z_1 = 14 + 14j; Z_2 = 4 + 3j; Z_3 = 5 + 5j; Z_4 = 5; Z_5 = 2 - 2j$$

Exercise II: OPAM in linear mode

In the figure, the OPAM is perfect and works in a linear domain

1. Explain why this AOP works in a linear domain
2. When V_e is positive the switch is in position 1. Calculate V_s in function of V_e
3. When V_e is negative the switch is in position 2. Calculate V_s in function of V_e and deduce the application of the diagram

Exercise III: Synchronous counter

By using master – slave JK, realize a synchronous counter modulo 7

- 1) Transition table of JK
- 2) Truth table
- 3) Equation of the inputs J and K
- 4) Wiring diagram of this counter

Exercise IV: Car's Alarm

The figure below illustrates the diagram of a circuit of a car's alarm which detects various no desirable situations. The three switches are used to indicate the state of the door of the conductor, starting and heading lights respectively. Design the logical circuit having these three switches like input, which sets the alarm when one of these situations occurs:

- The heading lights are on and starting button is off
- The door is opened and the starting contact is put

DO NOT REFER TO THE TEXT WHEN TAKING THIS TEST. A GOOD SCORE IS AT LEAST
Answers are in the back of the book. It's best to have a friend check your score the first time, so you won't memorize the answers if you want to take the test

Again.

1. An application in which an analog meter would almost always be preferred over a digital meter is:

- A. A signal-strength indicator in a radio receiver.
- B. A meter that shows power-supply voltage.
- C. A utility watt-hour meter.
- D. A clock.
- E. A device in which a direct numeric display is wanted.

2. Which of the following statements is false?

- A. The current in a series dc circuit is divided up among the resistances.
- B. In a parallel dc circuit, the voltage is the same across each component.
- C. In a series dc circuit, the sum of the voltages across all the components, going once around a complete circle, is zero.
- D. The net resistance of a parallel set of resistors is less than the value of the smallest resistor.
- E. The total power consumed in a series circuit is the sum of the wattages consumed by each of the components.

3. The ohm is a unit of:

- A. Electrical charge quantity.
- B. The rate at which charge carriers flow.

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- C. Opposition to electrical current.
- D. Electrical conductance.
- E. Potential difference.

4. A wiring diagram differs from a schematic diagram in that:

- A. A wiring diagram is less detailed.
- B. A wiring diagram shows component values.
- C. A schematic does not show all the interconnections between the components.
- D. A schematic shows pictures of components, while a wiring diagram shows the electronic symbols.
- E. A schematic shows the electronic symbols, while a wiring diagram shows pictures of the components.

5. Which of the following is a good use, or place, for a wirewound resistor?

- A. To dissipate a large amount of dc power.
- B. In the input of a radio-frequency amplifier.
- C. In the output of a radio-frequency amplifier.
- D. In an antenna, to limit the transmitter power.
- E. Between ground and the chassis of a power supply.

6. The number of protons in the nucleus of an element is the:

- A. Electron number.
- B. Atomic number.
- C. Valence number.
- D. Charge number.
- E. Proton number.

7. A hot-wire ammeter:

- A. Can measure ac as well as dc.

- B. Registers current changes very fast.
 - C. Can indicate very low voltages.
 - D. Measures electrical energy.
 - E. Works only when current flows in one direction.
8. Which of the following units indicates the rate at which energy is expended?
- A. The volt.
 - B. The ampere.
 - C. The coulomb.
 - D. The ampere hour.
 - E. The watt.

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9. Which of the following correctly states Ohm's Law?
- A. Volts equal amperes divided by ohms.
 - B. Ohms equal amperes divided by volts.
 - C. Amperes equal ohms divided by volts.
 - D. Amperes equal ohms times volts.
 - E. Ohms equal volts divided by amperes.
10. The current going into a point in a dc circuit is always equal to the current:
- A. Delivered by the power supply.
 - B. Through any one of the resistances.
 - C. Flowing out of that point.
 - D. At any other point.
 - E. In any single branch of the circuit.
11. A loudness meter in a hi-fi system is generally calibrated in:
- A. Volts.
 - B. Amperes.
 - C. Decibels.
 - D. Watt hours.
 - E. Ohms.
12. A charged atom is known as:
- A. A molecule.
 - B. An isotope.
 - C. An ion.
 - D. An electron.
 - E. A fundamental particle.
13. A battery delivers 12 V to a bulb. The current in the bulb is 3 A. What is the resistance of the bulb?
- A. 36 Ω .
 - B. 4 Ω .
 - C. 0.25 Ω .
 - D. 108 Ω .
 - E. 0.75 Ω .
14. Peak values are always:
- A. Greater than average values.
 - B. Less than average values.
 - C. Greater than or equal to average values.
 - D. Less than or equal to average values.
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- E. Fluctuating.
15. A resistor has a value of 680 ohms, and a tolerance of plus or minus 5 percent.

Which of the following values indicates a reject?

- A. 648 Ω .
- B. 712 Ω .
- C. 699 Ω .
- D. 636 Ω .
- E. 707 Ω .

16. A primitive device for indicating the presence of an electric current is:

- A. An electrometer.
- B. A galvanometer.
- C. A voltmeter.
- D. A coulometer.
- E. A wattmeter.

17. A disadvantage of mercury cells is that they:

- A. Pollute the environment when discarded.
- B. Supply less voltage than other cells.
- C. Can reverse polarity unexpectedly.
- D. Must be physically large.
- E. Must be kept right-side-up.

18. A battery supplies 6.0 V to a bulb rated at 12 W. How much current does the bulb draw?

- A. 2.0 A.
- B. 0.5 A.
- C. 72 A.
- D. 40 mA.
- E. 72 mA.

19. Of the following, which is not a common use of a resistor?

- A. Biasing for a transistor.
- B. Voltage division.
- C. Current limiting.
- D. Use as a "dummy" antenna.
- E. Increasing the charge in a capacitor.

20. When a charge builds up without a flow of current, the charge is said to be:

- A. Ionizing.
- B. Atomic.
- C. Molecular.

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- D. Electronic.
- E. Static.

21. The sum of the voltages, going around a dc circuit, but not including the power supply, has:

- A. Equal value, and the same polarity, as the supply.
- B. A value that depends on the ratio of the resistances.
- C. Different value from, but the same polarity as, the supply.
- D. Equal value as, but opposite polarity from, the supply.
- E. Different value, and opposite polarity, from the supply.

22. A watt hour meter measures:

- A. Voltage.
- B. Current.
- C. Power.
- D. Energy.

E. Charge.

23. Every chemical element has its own unique type of particle, called its:

A. Molecule.

B. Electron.

C. Proton.

D. Atom.

E. Isotope.

24. An advantage of a magnetic disk over magnetic tape for data storage is that:

A. Data is too closely packed on the tape.

B. The disk is immune to the effects of magnetic fields.

C. Data storage and retrieval is faster on disk.

D. Disks store computer data in analog form.

E. Tapes cannot be used to store digital data.

25. A 6-V battery is connected across a series combination of resistors. The resistance values are 1, 2, and 3 Ω . What is the current through the 2- Ω resistor?

A. 1 A.

B. 3 A.

C. 12 A.

D. 24 A.

E. 72 A.

26. A material that has extremely high electrical resistance is known as:

A. A semiconductor.

B. A paraconductor.

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C. An insulator.

D. A resistor.

E. A diamagnetic substance.

27. Primary cells:

A. Can be used over and over.

B. Have higher voltage than other types of cells.

C. All have exactly 1.500 V.

D. Cannot be recharged.

E. Are made of zinc and carbon.

28. A rheostat:

A. Is used in high-voltage and/or high-power dc circuits.

B. Is ideal for tuning a radio receiver.

C. Is often used as a bleeder resistor.

D. Is better than a potentiometer for low-power audio.

E. Offers the advantage of having no inductance.

29. A voltage typical of a dry cell is:

A. 12 V.

B. 6 V.

C. 1.5 V.

D. 117 V.

E. 0.15 V.

30. A geomagnetic storm:

A. Causes solar wind.

B. Causes charged particles to bombard the earth.

C. Can disrupt the earth's magnetic field.

D. Ruins microwave communications.

E. Has no effect near the earth's poles.

31. An advantage of an alkaline cell over a zinc-carbon cell is that:

- A. The alkaline cell provides more voltage.
- B. The alkaline cell can be recharged.
- C. An alkaline cell works at lower temperatures.
- D. The alkaline cell is far less bulky for the same amount of energy capacity.
- E. There is no advantage of alkaline over zinc-carbon cells.

32. A battery delivers 12 V across a set of six 4- Ω resistors in a series voltage dividing combination. This provides six different voltages, differing by an increment of:

- A.
1
/4V.

- B.
1
/3V.

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C. 1 V.

D. 2 V.

E. 3 V.

33. A unit of electrical charge quantity is the:

- A. Volt.
- B. Ampere.
- C. Watt.
- D. Tesla.
- E. Coulomb.

34. A unit of sound volume is:

- A. The volt per square meter.
- B. The volt.
- C. The watt hour.
- D. The decibel.
- E. The ampere per square meter.

35. A 24-V battery is connected across a set of four resistors in parallel. Each resistor has a value of 32 ohms. What is the total power dissipated by the resistors?

- A. 0.19 W.
- B. 3 W.
- C. 192 W.
- D. 0.33 W.
- E. 72 W.

36. The main difference between a "lantern" battery and a "transistor" battery is:

- A. The lantern battery has higher voltage.
- B. The lantern battery has more energy capacity.
- C. Lantern batteries cannot be used with electronic devices such as transistor radios.
- D. Lantern batteries can be recharged, but transistor batteries cannot.
- E. The lantern battery is more compact.

37. NICAD batteries are most extensively used:

- A. In disposable flashlights.
- B. In large lanterns.
- C. As car batteries.

- D. In handheld radio transceivers.
 - E. In remote garage-door-opener control boxes.
38. A voltmeter should have:
- A. Very low internal resistance.

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- B. Electrostatic plates.
 - C. A sensitive amplifier.
 - D. High internal resistance.
 - E. The highest possible full-scale value.
39. The purpose of a bleeder resistor is to:
- A. Provide bias for a transistor.
 - B. Serve as a voltage divider.
 - C. Protect people against the danger of electric shock.
 - D. Reduce the current in a power supply.
 - E. Smooth out the ac ripple in a power supply.
40. A dc electromagnet:
- A. Has constant polarity.
 - B. Requires a core with high retentivity.
 - C. Will not attract or repel a permanent magnet.
 - D. Has polarity that periodically reverses.
 - E. Cannot be used to permanently magnetize anything.
41. The rate at which charge carriers flow is measured in:
- A. Amperes.
 - B. Coulombs.
 - C. Volts.
 - D. Watts.
 - E. Watt hours.
42. A 12-V battery is connected to a set of three resistors in series. The resistance values are 1,2, and 3 ohms. What is the voltage across the 3- Ω resistor?
- A. 1 V.
 - B. 2 V.
 - C. 4 V.
 - D. 6 V.
 - E. 12 V.
43. Nine 90-ohm resistors are connected in a 3 \times 3 series-parallel network. The total resistance is:
- A. 10 Ω .
 - B. 30 Ω .
 - C. 90 Ω .
 - D. 270 Ω .
 - E. 810 Ω .

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44. A device commonly used for remote switching of wire communications signals is:
- A. A solenoid.
 - B. An electromagnet.
 - C. A potentiometer.

D. A photovoltaic cell.

E. A relay.

45. NICAD memory:

A. Occurs often when NICADs are misused.

B. Indicates that the cell or battery is dead.

C. Does not occur very often.

D. Can cause a NICAD to explode.

E. Causes NICADs to reverse polarity.

46. A 100-W bulb burns for 100 hours. It has consumed:

A. 0.10 kWh.

B. 1.00 kWh.

C. 10.0 kWh.

D. 100 kWh.

E. 1000 kWh.

47. A material with high permeability:

A. Increases magnetic field quantity.

B. Is necessary if a coil is to produce a magnetic field.

C. Always has high retentivity.

D. Concentrates magnetic lines of flux.

E. Reduces flux density.

48. A chemical compound:

A. Consists of two or more atoms.

B. Contains an unusual number of neutrons.

C. Is technically the same as an ion.

D. Has a shortage of electrons.

E. Has an excess of electrons.

49. A 6.00-V battery is connected to a parallel combination of two resistors, whose values are 8.00 Ω and 12.0 Ω . What is the power dissipated in the 8- Ω resistor?

A. 0.300 W.

B. 0.750 W.

C. 1.25 W.

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D. 1.80 W.

E. 4.50 W.

50. The main problem with a bar-graph meter is that:

A. Is isn't very sensitive.

B. It isn't stable.

C. It can't give a very precise reading.

D. You need special training to read it.

E. It shows only peak values.