

ELT 101: Basic Electricity: AC/DC

Final Exam

NAME _____

DATE _____

Circle the most correct answer (1 point each for a total of 100 points)

Basic principles of electricity: the atom, electric current, conductors and insulators, uses in the utility industry

1) An electrical shock:

- A) occurs when the body becomes part of an electrical path
- B) is annoying but can rarely hurt you
- C) can only occur if your body is wet
- D) all of the above

2) The generally acknowledged amount of current that can be fatal is:

- A) 10 milliamps
- B) 100 milliamps
- C) 1 amp
- D) 5 amps

3) Scientific notation allows us to easily express very large number, but not very small numbers.

- A) True
- B) False

4) Scientific notation and engineering notation are basically the same thing.

- A) True
- B) False

5) What is correct scientific notation for the number 0.0047?

- A) 0.47×10^{-3}
- B) 4.7×10^{-2}
- C) 4.7×10^{-3}
- D) 47×10^{-2}

6) Which of the below are commonly used in engineering notation to represent small numbers?

- A) milli
- B) micro
- C) nano
- D) all of the above

7) LO/TO/TO stands for:

- A) Look Out/Test Out/Try Out
- B) Lock Out/Test Out/Try Out
- C) Lock Out/Test Out/Try Out
- D) Lock Out/Try Out/Tag Out

8) The charge of an electron is

- A. Positive
- B. Negative
- C. Neutral

9) This particle has a positive charge

- A. Proton
- B. Neutron
- C. Electron
- D. all of the above

10) One coulomb equals

- A. 6.24×10^{18} electrons
- B. 6.24×10^{-18} electrons
- C. 6.24×10^8 electrons
- D. 6.24×10^{19} electrons

11) Opposite charges:

- A. Are neutral
- B. Repel
- C. Attract
- D. Are always equal

12) The outer electron orbit in any atom is called the:

- A. outer shell
- B. far orbit
- C. valence orbit
- D. electron shell

13) How many amps are there in 250,000 millamps?

- A. 250 amps
- B. 0.25 amps
- C. 2.5 amps
- D. 25 amps

14) What has more free electrons:

- A. Insulators
- B. Conductors
- C. Both A & B
- D. none of the above

Electric circuits: pressure, power, energy, Ohm's Law

1) Voltage is:

- A. electrical pressure
- B. a difference of potential
- C. charge separation
- D. all of the above

2) A battery converts what into electrical energy?

- A. motion
- B. light
- C. heat
- D. chemicals

3) You want to increase the voltage by connecting multiple batteries. To do this you must:

- A. connect the batteries in parallel (plus to plus, minus to minus)
- B. connect the batteries in series (minus to minus)
- C. connect the batteries in series (plus to minus)
- D. connect the batteries in parallel (minus to plus, plus to minus)

4) Three 6V batteries are connected in parallel. What is their combined voltage?

- A. 0V
- B. 6V
- C. 12V
- D. 18V

5) Current is _____ electron drift.

- A. random
- B. one way
- C. directed
- D. none of the above

- 6) Current is measured in _____.
- A. coulombs
 - B. amperes
 - C. amperes per second
 - D. coulombs per minute
- 7) A DMM is a:
- A. digital multi-meter
 - B. dynamic multi-meter
 - C. digital measurement meter
 - D. dynamic measurement meter
- 8) Voltage is measured _____ a component.
- A. across
 - B. in line with
 - C. either A or B
- 9) Current is measured _____ a component.
- A. across
 - B. in line with
 - C. either A or B
- 10) PPE stands for:
- A. Peter Piper Express
 - B. Personal Protective Equipment
 - C. Personal Protected Environment
 - D. none of the above
- 12) There is no difference between a cell and a battery.
- A. true
 - B. false

13) Current is measured with a(n):

- A. voltmeter
- B. wattmeter
- C. ohmmeter
- D. ammeter

14) When measuring current:

- A. the voltage must be turned off
- B. the meter is connected across the load
- C. the meter is inserted into and becomes part of the circuit
- D. the meter is connected across the voltage source

15) Why is measuring voltage with a meter set to read current so dangerous?

- A. because you have to break the circuit
- B. because you're effectively placing a short across the point to be measured
- C. because voltage can kill you, current can't
- D. because measuring voltage is more difficult than measuring current
- E. none of the above

16) In a shorted circuit, the voltage across the short would be:

- A. normal
- B. very high
- C. very low

17) In a shorted circuit, the current through the short would be:

- A. very high
- B. normal
- C. very low

- 18) In an open circuit that is powered, the voltage across the open would be:
- A. equal to the source voltage
 - B. high
 - C. low
- 19) In an open circuit, the resistance of the component that is open would be:
- A. zero
 - B. normal
 - C. high
 - D. infinite
- 20) In an open circuit, the current through the open component would be:
- A. low
 - B. high
 - C. zero
 - D. normal
- 21) A resistor's color code is red, red, red, silver. What is its resistance and tolerance?
- A. 2.2K ohm, 10%
 - B. 3.3K ohm, 10%
 - C. 2.2K ohm, 20%
 - D. 220 ohm, 10%
- 22) The unit of measurement of resistance is the:
- A. siemen
 - B. bohr
 - C. conductor
 - D. none of the above

- 23) The watt is the unit measurement for:
- A. power
 - B. energy
 - C. joules
 - D. heat
- 24) Power is the _____ at which energy is transformed.
- A. way
 - B. rate
 - C. purpose
 - D. none of the above
- 25) The Greek symbol for the unit of resistance is:
- A. alpha
 - B. epsilon
 - C. omega
 - D. theta
- 26) A rheostat is a _____ terminal device and a potentiometer is a _____ terminal device.
- A. one, two
 - B. two, three
 - C. two, one
 - D. three, two
- 27) With the AWG system of wire gauge:
- A. the higher the number, the larger the wire diameter
 - B. the higher the number, the smaller the diameter the wire
 - C. the number tells you the resistivity of the wire
 - D. the number tells you the conductance of the wire

28) You know a circuit's voltage and you need to calculate power using Ohm's Law. The only thing else you need to know is: (select all that are correct):

- A. the current
- B. nothing else
- C. the capacitance
- D. the resistance

29) A 3K ohms load is connected in series with a 12V supply. The current flowing is:

- A. 40mA
- B. 400mA
- C. 250mA
- D. 4mA

30) A 3K ohms load is connected in series with a 12V supply. The power used by the circuit is:

- A. 4.8W
- B. 480mW
- C. 4.8mW
- D. 48mW

31) A 10K ohm resistor is in series with a 10V supply. The current flowing is:

- A 100A
- B. 1mA
- C. 100mA
- D. 10A

32) A circuit's voltage is 100V and the current flowing is 20mA. What is the circuit's resistance?

- A. 5K ohms
- B. 500 ohms
- C. 2K ohms
- D. 5 ohms

- 33) A circuit has 20 ohms of resistance with 100mA flowing. What is the applied voltage?
- A. 2 volts
 - B. 200 volts
 - C. 200mV
 - D. 20 volts
- 34) A circuit with 1K ohm resistance and 100V applied uses how much power?
- A. 100mW
 - B. 100W
 - C. 10W
 - D. 1W
- 35) In a circuit the voltage is doubled. What will the current do in the circuit assuming the resistance stays the same.
- A. double
 - B. stay the same
 - C. triple
 - D. halve
- 36) In a circuit the current suddenly doubles. The resistance stays the same. What has happened to the circuit?
- A. the voltage has tripled
 - B. the voltage was doubled
 - C. the voltage was reduced by one half
 - D. the circuit has opened

37) Doubling the resistance in a circuit will:

- A. increase the power by 2
- B. increase the voltage by a factor of 2
- C. double the current
- D. reduce the current by one half

Building DC circuits

1) In a series circuit, only _____ path(s) exist for current flow.

- A. one
- B. two
- C. three
- D. four

2) A series circuit is often referred to as a:

- A. current divider
- B. voltage divider
- C. both A & B
- D. none of the above

3) In a series circuit, current is:

- A. common
- B. the same in all parts of the circuit
- C. equal to the sum of the individual currents
- D. both A & B

4) In a series circuit, voltage is:

- A. common
- B. the same in all parts of the circuit
- C. the sum of the individual voltages
- D. the same as the source voltage
- E. none of the above

- 5) The amount of voltage dropped across a resistor is directly proportional to:
- A. the value of the resistor
 - B. the physical size of the resistor
 - C. both A & B
 - D. none of the above
- 6) A short is evident in a series circuit because:
- A. current stops flowing
 - B. the voltage across the shorted resistor equals zero
 - C. the voltage across the shorted resistor equals the source voltage
 - D. current decreases
- 8) An open is evident in a series circuit because:
- A. current stops flowing
 - B. the voltage across the open resistor equals zero
 - C. the voltage across the open resistor equals the source voltage
 - D. both A and C
- 9) You can calculate power in a series circuit by:
- A. multiplying the applied voltage by the total current
 - B. adding together the power dissipation of the individual resistors
 - C. multiplying the square of the circuit current by the total resistance
 - D. all of the above
- 10) If three resistors have voltage drops of 10, 20 and 50 volts, what is the source voltage?
- A. 20 volts
 - B. 30 volts
 - C. 50 volts
 - D. 80 volts

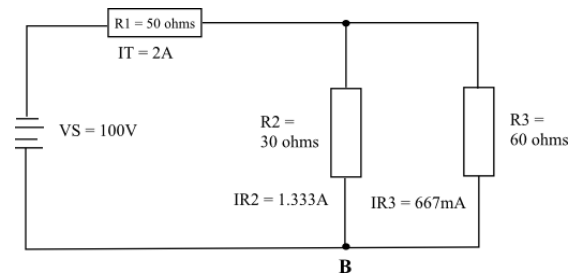
- 11) A 1K ohm, 6K ohm and 3.3K ohm resistor are connected in series. What is their total resistance?
- A. 10.003K ohms
 - B. 10.03K ohms
 - C. 10.3K ohms
 - D. 4K ohms
- 12) A 200 ohm resistor is connected in series with a 100 ohms resistor and a 15V supply. What resistance does the source voltage see?
- A. 50 ohms
 - B. 300 ohms
 - C. 75 ohms
 - D. 100 ohms
- 13) A 200 ohm resistor is connected in series with a 100 ohms resistor and a 15V supply. What is the total circuit current?
- A. 5A
 - B. 500mA
 - C. 50mA
 - D. 5mA
- 14) A 200 ohm resistor is connected in series with a 100 ohms resistor and a 15V supply. What is the voltage drop across the 200 ohm resistor?
- A. 2 volts
 - B. 10 volts
 - C. 5 volts
 - D. 15 volts

- 15) A 200 ohm resistor is connected in series with a 100 ohms resistor and a 15V supply. What is the power used by the 100 ohm resistor?
- A. 250mW
 - B. 2.5mW
 - C. 500 mW
 - D. 25mW
- 16) In a parallel circuit, _____ path(s) exist for current flow.
- A. one
 - B. two or more
 - C. at least three
 - D. none of the above
- 17) A parallel circuit is often referred to as a:
- A. current divider
 - B. voltage divider
 - C. both A & B
 - D. none of the above
- 18) In a parallel circuit, voltage is:
- A. common
 - B. that same across all the parts of the circuit
 - C. equal to the sum of the individual voltages
 - D. both A & B
- 19) In a parallel circuit, current is:
- A. common
 - B. the same in all parts of the circuit
 - C. the sum of the branch currents
 - D. none of the above

- 20) The amount of current through a resistor in a parallel circuit is inversely proportional to:
- A. the value of the resistor
 - B. the voltage across in the resistor
 - C. both A & B
 - D. none of the above
- 21) A node has 6.5 amps and 3 amps coming into it, what is the current out?
- A. 3A
 - B. 3.5 A
 - C. 9.5 A
 - D. 6.5 A
- 22) A small branch resistance will result in a _____ branch current.
- A. small
 - B. medium
 - C. large
 - D. infinite
- 23) If two resistors are in parallel, their total resistance equals::
- A. the sum of the resistors
 - B. three times the value of one resistor
 - C. the product over the sum
 - D. the sum over the product
- 24) Four 1k ohm resistors are in parallel, the total resistance equals:
- A. 200 ohms
 - B. 250 ohms
 - C. 500 ohms
 - D. 1k ohms
 - E. 4k ohms

- 25) Total power in a parallel circuit equals:
- total current times the applied voltage
 - total current divided by the applied voltage
 - current times the total resistance squared
 - none of the above
- 26) A series-parallel circuit is a combination of
- components connected end to end
 - series (one-path) circuits
 - both series and parallel circuits
 - parallel (two or more path) circuits

- 27) Referring to the circuit at right, what is the current flowing out of node B?
- 887 mA
 - 1.33 A
 - 667 mA
 - 2 A



- 28) Referring to the circuit above, what is the total circuit power?
- 20mW
 - 20 watts
 - 200mW
 - 200 watts
- 29) When calculating R_T in a complex series-parallel circuit, it is best to start:
- as far away as possible from the voltage source
 - in the middle of the circuit
 - as close to the voltage source as possible
 - working with parallel combinations first

- 30) Any series-parallel circuit can be simplified into a _____ and a _____.
- A. voltage source, equivalent resistance
 - B. current source, voltage divider
 - C. resistance, power rating
 - D. power rating, battery
- 31) The toughest part of analyzing series-parallel circuits is:
- A. using the trigonometry involved
 - B. determining what's in series and what's in parallel
 - C. calculating power
 - D. none of the above
- 32) The simplest technique to identifying series and parallel components is to:
- A. flow voltage
 - B. flow current
 - C. use Ohm's Law
 - D. guess

Electric systems: generating, transmission, sub-station and distribution systems

- 1) A conductor will have an induced current or voltage only when there is:
- A. a stationary magnetic field
 - B. a stationary conductor
 - C. relative motion between the wire and the magnetic field
 - D. both A and B
- 2) A solenoid is a mechanical switch activated by a magnetic coil.
- A. true
 - B. false

- 3) Which of the below are an advantage a DC motor offers over an AC motor?
- A. higher torque
 - B. reversibility
 - C. variable speed
 - D. all of the above
- 4) What happens to a 3-phase motor when it loses one phase?
- A. it immediately stops
 - B. it keeps running, but less efficiently
 - C. it speeds up
 - D. none of the above
- 5) A transformer with an input of 480VAC and an output of 120VAC is a:
- A. isolation transformer
 - B. auto-transformer
 - C. step-up transformer
 - D. none of the above
- 6) A transformer:
- A. changes DC to AC
 - B. can increase or decrease an AC voltage
 - C. allows transmission of DC voltage
 - D. changes AC to DC
- 7) Peak voltage may be calculated by:
- A. multiplying RMS voltage by .707
 - B. dividing RMS voltage by .707
 - C. multiplying RMS voltage by 1.414
 - D. both B and C

- 8) A wave has a period of 400mS. What is the frequency of the wave?
- A. 2.5KHz
 - B. 250 Hz
 - C. 25KHz
 - D. 2.5Hz
- 9) When using transformers in electrical power circuits, the primary purpose of the transformer is to:
- A. step up or down DC voltage.
 - B. Step up or step down AC voltage.
 - C. Provide isolation
 - D. provide impedance matching,
- 10) How do you reduce Eddy Current losses in a transformer?
- A. Use larger copper wire for the transformer windings
 - B. increase the number of secondary windings
 - C. Reduce the transformers size.
 - D. Laminate the transformers core.
- 11) Small dots next to the primary and secondary windings on a transformers schematic indicate:
- A. the high and low side.
 - B. what sides should be grounded.
 - C. the transformer's phase relationship
 - D. the hot side of the transformer.
- 12) An inductor stores electrical energy in the form of a(n) _____ field, just as a capacitor stores electrical energy in the form of a(n) _____ field.
- A. electric, magnetic
 - B. magnetic, electric

- 13) Inductors oppose changes in:
- A. current
 - B. voltage
 - C. resistance
 - D. inductance
- 14) The unit of inductance is the:
- A. maxwell
 - B. ohm
 - C. tesla
 - D. henry
- 15) The capacitance of a capacitor is directly proportional to:
- A. the plate area
 - B. the distance between the plates
 - C. the constant of the dielectric used
 - D. both A and C
 - E. both A and B
- 16) The capacitance of a capacitor is inversely proportional to:
- A. the plate area
 - B. the distance between the plates
 - C. the dielectric used
 - D. both A and C
- 17) Capacitors store energy in the form of:
- A. a magnetic field
 - B. an electrostatic field
 - C. an electromagnetic field
 - D. a positive field

Points possible:

Basic principles of electricity: the atom, electric current, conductors and insulators, uses in the utility industry **(14)**

Electric circuits: pressure, power, energy, Ohm's Law **(37)**

Building DC circuits **(32)**

Electric systems: generating, transmission, sub-station and distribution systems **(17)**

Total: **100**

***** end of final exam *****