Title: **Theory Final** Test: Final

Course: Electrical Applications Unit: Electrical Theory CLO: 3

Name ANSWER KEY Grade 109pts. Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Objectives**

1. Student shall identify specific characteristics of both AC and DC circuits.
2. Student shall calculate various quantities based on given AC and DC circuit values.

**Assessment**

Students shall demonstrate a comprehension of the objectives listed above by scoring a minimum of 75% on this Test. Grading shall be based on an answer key.

**Instructions**

Select the best answer to each multiple-choice question below.

Resistance

1. A series circuit can also be thought of as a;
   1. Voltage Divider
   2. Current Divider
   3. Power Divider
   4. Resistance Divider
2. What is common in a series circuit;
   1. Voltage
   2. Current
   3. Power
   4. Resistance
3. In a series circuit, if a resistor is added in series the circuit current shall;
   1. Increase
   2. Decrease
   3. Stay the same
   4. Go to 0
4. A parallel circuit can also be thought of as a;
   1. Voltage Divider
   2. Current Divider
   3. Power Divider
   4. Resistance Divider
5. What is common in a parallel circuit;
   1. Voltage
   2. Current
   3. Power
   4. Resistance
6. In a parallel circuit, if a resistor is added in parallel the circuit current shall;
   1. Increase
   2. Decrease
   3. Stay the same
   4. Go to 0

Magnetism

1. Flux Lines are lines of force that flow from the South Pole to the North Pole outside the magnet.
   1. True
   2. False
2. The right-hand rule for a generator states that if you hold the thumb, first and second finger of your right hand in mutually perpendicular position, the second finger will indicate what?
3. the south pole
4. the north pole
5. conventional current flow
6. lines of magnetic force
7. The right-hand grip rule for a coil states, “if the fingers point in the direction of conventional current flow, then the thumb will indicate the \_\_\_”
8. south pole
9. north pole
10. direction of current flow
11. lines of reluctance

AC Calculations & Terms

1. One complete AC sine wave consists of how many positive alternations?
2. 3
3. 1
4. 4
5. 2
6. What value of AC voltage is equivalent to DC voltage?
7. peak to peak
8. root mean square
9. peak
10. Instantaneous
11. What is the RMS voltage if the given voltage is 15 VPP?
12. 7.5V
13. 10.606V
14. 5.303V
15. 21.213V
16. What is the peak voltage if the RMS voltage is 24V?
17. 16.97VP
18. 33.94VP
19. 12.00VP
20. 8.485VP
21. What is the instantaneous voltage at 197˚ when the given voltage is 10VP?
22. 34.203Vi
23. –2.923Vi
24. –6.846Vi
25. 6.846Vi
26. A sine wave takes 10mSec to complete 360˚ of rotation. The frequency of the sine wave is?
27. 10Hz
28. 100Hz
29. 1kHz
30. 200Hz
31. A given value of instantaneous voltage occurs at the following degrees on the sine wave: 25˚ and 155˚ positive and \_\_\_\_\_ and \_\_\_\_\_\_ negative.
32. 215˚,370˚
33. 205˚,335˚
34. 205˚,375˚
35. 215˚,355˚
36. The electrical term which represents the total opposition to the flow of AC current is \_\_\_\_\_.
37. Inductance
38. Reactance
39. Impedance
40. Admittance
41. The term “VARs” can be defined as:
42. A type of AC power that does not convert electrical energy (wasted power).
43. The total opposition to AC current as a result of circuit impedance.
44. A type of AC power that converts all the electrical energy to heat.

Inductors & Transformers

1. How can the value of an inductor increase?
2. increase the number of turns
3. increase the resistance of the wire
4. change the iron core to an air core
5. Increase the current through the inductor
6. What is the value of XL if the inductor is rated at 5H and the frequency is 60Hz?
7. 1.884VA
8. 1.884kΩ
9. 2.224kΩ
10. 2.224VA
11. Counter Electromotive Force (CEMF) is:
12. The induced voltage that produced a magnetic field.
13. The induced voltage that opposes the source that created it.
14. The induced voltage that aids the source that created it.
15. The induced voltage that produces the current.
16. The phase relationship between current and voltage in an inductive circuit:
17. current will lead the voltage.
18. voltage will lead the current.
19. voltage and current will be in phase.
20. Increasing the turns ratio in the secondary of a transformer will:
21. Increase the power in the primary
22. Increase the current in the secondary
23. Increase the voltage in the secondary
24. Decrease resistance in the secondary
25. Increasing the turns ratio in the primary of a transformer will:
26. Decrease the power in the secondary
27. Decrease the current in the secondary
28. Decrease the voltage in the secondary
29. Increase the permeability in the secondary
30. A transformer has a turns-ratio of 4:1, the current in the secondary is 12.5 mA, what is the primary current?
31. 39.063mA
32. 3.125mA
33. 781.25µA
34. 320µA
35. A transformer has a turns-ratio of 1:5; the primary voltage is 4.6 V, what is the secondary voltage?
36. 23V
37. 920mV
38. 1.087V
39. 5.435V
40. The transformer has which type of connection between the primary and the secondary?
41. Electric
42. Magnetic
43. Electronic
44. Unlisted
45. Transformers operate by the principle of:
46. Mutual attraction
47. Mutual inductance
48. Coefficient of coupling
49. Inductive reactance

Capacitors

1. Capacitors store an \_\_\_\_\_\_\_\_\_\_\_ charge.
   1. electromagnetic
   2. electrostatic
   3. electro-capacitive
2. Decreasing the distance between the plates of a capacitor will cause the total capacitance to \_\_\_\_\_.
3. increase
4. decrease
5. not change
6. Three capacitors are connected in series: C1=10µF, C2=15µF, and C3=25µF. The total capacitance is:
7. 50µF
8. 4.839µF
9. 4.839mF
10. 1.132µF
11. If the area of the plates of a capacitor increases, capacitance will \_\_\_\_\_\_.
12. Stay the same
13. Decrease
14. Increase
15. Each branch of a two-branch parallel circuit contains one capacitor each. The branch capacitance is unequal. The total circuit capacitance:
16. Will be equal to the sum of all the capacitors.
17. Will be smaller than the smallest capacitor.
18. Will be equal to the largest capacitor.
19. In a(n)\_\_\_\_\_\_\_\_\_ circuit, the current leads the voltage by 90°.
20. Vector
21. Inductive
22. Capacitive
23. Variable

RL Circuits

**Circuit**



|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | P/Q/S | | I | | R/X/Z | E |
| R1 | 20.568mW | | 7.666mA | | 350Ω | 2.683V |
| L1 | 73.849mVAR | | 7.666mA | | 1.257kΩ | 9.633V |
| Total | 76.660mVA | | 7.666mA | | 1.304kΩ | 10V |
| θ | 74.436˚ | PF | 0.268 |

1. If the inductor would increase to 400mH, the phase angle would \_\_\_\_\_\_\_?
2. decrease
3. increase
4. stay the same
5. A certain AC parallel circuit consists of resistances only, no inductive or capacitive reactance. The circuit’s active power will be equal to the circuit \_\_\_\_\_\_\_.
6. VARs
7. volt-amps
8. power factor
9. One way to decrease the phase angle of a parallel RL circuit is to \_\_.
10. Decrease the value of the inductor
11. Increase the value of circuit resistance
12. Add a capacitive branch to the circuit
13. All the above
14. If the frequency of an RL series circuit is lowered the inductive reactance:
15. increases
16. decreases
17. stays the same
18. A parallel AC RL circuit has 25mA through the inductor and 77mA through the resistor. Calculate the circuit’s total current.
19. 102mA
20. 26.3mA
21. 80.9mA
22. Increasing the turns in an inductor will:
23. Increase the inductance
24. Decrease the inductance
25. Have no effect on the inductance
26. It is possible for a resistive-inductive (RL) circuit to have a phase angle of 0˚.
27. True
28. False
29. A two-branch parallel AC circuit contains the following: branch #1 has a coil with an inductance reactance of 240Ω and branch #2 has 25V across it. The inductive current is?
30. 104.167mA
31. 247.341mA
32. 77.25mA
33. A parallel AC RL circuit has 25mA through the inductor and 77mA through the resistor. Calculate the percent power factor.
34. 18.8%
35. 95.1%
36. 73.4%

RC Circuits

**Circuit**



|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | P/Q/S | | I | | R/X/Z | E |
| R1 | 244.169mW | | 9.883mA | | 2.5kΩ | 24.707V |
| C1 | 310.885mVAR | | 9.883mA | | 3.183kΩ | 31.458V |
| Total | 395.307mVA | | 9.883mA | | 4.047kΩ | 40.000V |
| θ | 51.854 | PF | 0.618 |

1. If the value of resistance were to decrease, the circuit phase angle will \_\_\_\_\_\_.
2. increase
3. decrease
4. stay the same
5. The phase relationship between current and voltage in a totally resistive AC circuit is:
6. current will lead the voltage.
7. voltage will lead the current.
8. voltage and current will be in phase.
9. If the frequency applied to an RC series circuit increases, the phase angle will \_\_\_\_\_\_\_.
10. decrease
11. Increase
12. Not change
13. In a parallel RC circuit the voltage across the resistor is
14. in phase with the capacitor current
15. Lagging the source voltage by up to 90°
16. In phase with the current thru the resistor
17. Lagging the current by up to 90°
18. A certain AC parallel circuit consists of resistances only, no inductive or capacitive reactance. The circuit watts will be equal to the circuit \_\_\_\_\_\_\_.
19. VARs
20. volt-amps
21. power factor
22. What is the phase angle in an inductive circuit that has a reactive power of 10kVARs and a true power of 10kW?
23. 0°
24. 90°
25. 45°
26. An AC circuit power factor is 100%. This indicates that the circuit phase angle is \_\_\_\_\_\_.
27. 90°
28. 45°
29. 180°
30. 0°
31. When the frequency is increased, the total current of a parallel RL circuit \_\_\_\_\_\_.
32. increases
33. decreases
34. remains the same
35. A certain AC parallel circuit draws 50 amps from the source. The amount of resistive current flowing is 40 amps. This circuit has a power factor of \_\_\_\_\_\_.
36. 125%
37. 75%
38. 100%
39. 80%
40. A certain AC circuit dissipates 100W. The circuit is supplied with 125VA. What is the power factor?
41. 125%
42. 80%
43. 75%
44. 100%
45. A certain RC circuit has its capacitance doubled. The reactance of this circuit shall?
46. double
47. triple
48. be halved
49. remain the same
50. A capacitor is made of two dielectrics separated by a metal plate.
51. True
52. False
53. A capacitor resists changes in:
    1. Reactance
    2. Voltage
    3. Current

RLC Circuits

**Circuit**



|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | P/Q/S | | I | | R/X/Z | E |
| R1 | 387.931mW | | 25.862mA | | 580Ω | 15V |
| L1 | 39.789mVAR | | 2.653mA | | 5.655kΩ | 15V |
| C1 | 5.655mVAR | | 376.991μA | | 39.789kΩ | 15V |
| Total | 387.987mVA | | 25.866mA | | 579.916Ω | 15V |
| θ | 5.028˚ | PF | .996 |

1. This circuit is considered to use its power very efficiently.
2. true
3. false
4. If the value of resistance were to decrease, the circuit phase angle will \_\_\_\_\_\_.
5. increase
6. decrease
7. stay the same
8. If the voltage is decreased, the power factor will?
9. Increase
10. Decrease
11. Stay the same
12. If the capacitance is increased, the total impedance will?
13. Increase
14. Decrease
15. Stay the same
16. If the resistance is increased, the total current will?
17. Increase
18. Decrease
19. Stay the same