Laxmi Institute of Technology, Sarigam

Approved by AICTE, New Delhi; Affiliated to Gujarat Technological University, Ahmedabad.

Academic Year 2019-20

Subject: AC CIRCUITS (3330901)

ASSIGNMENT: 1

1. Explain how alternating e.m.f. is generated and derive $e = E_m \sin\theta$.
2. Define following terms :
   a) Cycle
   b) Time Period
   c) Frequency
   d) Instantaneous value
   e) Maximum value or Amplitude
   f) angular frequency
   g) RMS value
   h) average value
   i) Form factor
   j) Peak factor
   k) Phase
   l) Phase difference
3. Write down four different expressions of alternating voltage.
4. Derive the expression for R.M.S. value of alternating current $I_{RMS} = 0.707\ I_m$.
5. Derive relation for alternating current, $I_{av} = 0.637 I_m$.
6. Explain the vectors representation ofalternating quantity.
7. Explain Addition and Subtraction of Alternating voltage and current with the help of vectors.
8. Draw the waveform for two alternating EMF represent by equations $E_1 = E_{1m} \sin\Phi$ and $E_2 = E_{2m} \sin(\Phi - \theta)$ and show how much phase difference is their between them .(consider $E_{1m} > E_{2m}$)
9. Explain the four different forms of mathematical representation of vectors.
10. Explain the four mathematical operations of vectors.

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Subject: AC CIRCUITS (3330901)

TUTORIAL: 1

1. An alternating current is given by equation i = 300sin628t.
   Find 1) Maximum value 2) RMS value 3) average value. 4) Frequency 5) Time period 6) Value of current after 0.01 sec.
2. An alternating current of frequency 50Hz has RMS value of 10Amp.Write the equation for its instantaneous value and calculate 1)Average current 2)Time period 3) time taken to reach the +5 A after zero positive
3. An alternating e.m.f. is represented by e = 200 sin (314t + 30°). Find its 1) Maximum value 2) R.M.S. value 3) Average value.
4. Two vectors are A = 25 + j30 and B = 15 – j45. Find A + B and draw the vector diagram of this addition.
5. Two vectors are A=25+j10 and B=10+j15 find (A+B) , (A-B) , (A×B) and (A÷B).
6. If i1= 10 sin (wt – π/6) and i2 = 15 sin (wt + 2 π/3) . Find i1 –i2.
7. Convert the vector 9+j7 into polar form and draw the vector diagram.
8. Voltage is **V=** 20+j5 and current is **I**= 17 +j4. Calculate the resistance and total power of the circuit.

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Subject: AC CIRCUITS (3330901)

ASSIGNMENT: 2

1. Prove that in pure resistive circuit power consumed is $P=I^2R$
2. Prove that for pure inductive circuit, the current lags applied voltage by 90°.
3. Draw waveform of voltage, current and power for pure capacitive circuit.
4. Prove that active power consumption in pure capacitive circuit is zero when connected to alternating voltage. OR

   Obtain the expressions for current and power through pure capacitor with necessary diagrams.
5. Explain A.C. through R-C series circuit with necessary diagrams.
6. Explain AC through L-C series circuit with vector diagram.
7. Draw power triangle and name three components of it.
8. What is Q factor of a coil? What is Bandwidth?
9. Define Series Resonance and State the condition for resonance in R-L-C series circuit. Derive expression for resonant frequency and also state the value of net impedance and the value of current at resonance condition. State uses of Series Resonance.
10. Draw R-L-C series circuit, give equation of impedance and draw vector diagrams for $X_L > X_C$ (ii) $X_L < X_C$.

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Subject: AC CIRCUITS (3330901)

TUTORIAL : 2

1. Write the equation of voltage and current when 100 V, 50Hz supply is given to a pure resistor of 20 Ω. Find the power loss in the resistor.
2. A resistor of 100Ω and an inductor of 500 mH are connected in series across a 250 V, 50 Hz. A.C. supply. Calculate (i) Inductive reactance (ii) Impedance(iii) Current (iv) True power (v) Apparent power (vi) Reactive power (vii) power factor (viii) voltage across R & L.
3. A resistor of 100Ω and a capacitor of 25 μF are connected in series across a 100 V, 50 Hz. A.C. supply. Calculate (i) Capacitive reactance (ii) Impedance (iii) Current (iv) Active power (v) Apparent power (vi) Reactive power, (iii) power factor (iv) voltage across R & C.
4. RLC circuit with resistance of 30 Ω, inductance of 20mH and capacitance of 10 μF is connected across 12 volt AC. Determine the resonance frequency and Q factor of the circuit. Calculate current flowing through circuit at resonance.
5. A 0.3 H inductor is connected in series with 47 Mf capacitor. It is given 200V, 50Hz A.C. Supply. Calculate (a)Net Reactance(b))voltage drop across inductor and capacitor(c)Current (d) power factor(e)Power Loss.
6. A 20 Ω resistor is connected in series with a coil having resistance of 10 Ω and 100mH and a 100μF capacitor. This series combination is connected across a 110 V, 60 Hz AC supply. Find (1) impedance of the circuit (2) current (3) voltage drop across external resistance, coil and capacitor (4) power factor of the circuit (5) power loss in the circuit and (6) Power consumption in coil.
7. A coil is connected to 200v, 50Hz supply It carries a current of 10 amp and consumes a power of 2500W. Find its (1) resistance (2) inductive reactance (3) impedance (4) power factor and (5) reactive power in the circuit.
8. Two impedances Z_1 =3+j 9 and Z2 =4-j 20 are connected in series and connected to 250 V, 50Hz supply. Calculate (1)total impedance of the circuit (2) current through the circuit (3) power factor of the circuit (4)Draw the vector diagram.
9. A resistor of 25 ohm, inductor of 0.3 H and capacitor of 200 μF are connected in series across 110V, 50 Hz I-ϕ A.C. supply. Calculate 1) reactance 2) impedance 3) Power factor 4) Current 5) True power 6) Reactive power 7) Apparent power

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Subject: AC CIRCUITS (3330901)

ASSIGNMENT NO: 3

1. State the methods of solving AC parallel circuits.
2. Explain the vector method for solving A.C. parallel circuit.
3. Explain the terms 1) Admittance 2) Conductance 3) Susceptance 4) Magnification factor.
4. Explain the admittance method used to solve A.C. parallel circuits.
5. Explain the Complex Algebra method for solving A.C. parallel circuits.
6. Give expressions for resonant frequency in series and parallel resonance.
7. Draw graphical representation of parallel resonance showing variation of various parameters with change in supply frequency.
8. What is quality factor? Explain the Q factor in parallel circuit. Derive expressions for Q factor for series and parallel resonance.
9. What are the applications of parallel resonance?
10. Compare series resonance and parallel resonance.

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Subject: AC CIRCUITS (3330901)

TUTORIALNO: 3

1. A 50 Ω resister,1 H inductor and 47μF capacitor are connected in parallel to 100 volt, 50 Hz supply. Calculate (i) current through each branch (ii) supply current, (ii) power factor (iv) power loss.
2. An impedance of 8 + j 6 Ω is connected in parallel to the impedance of 3- j 4 Ω. Current drawn from the supply is 25 A. Find the branch currents and total current.
3. Two impedances (10+j 47.1) Ω and (50 –j 15.91) Ω are connected in parallel across 200 volts, 50 Hz supply. Find admittance, total current and power factor of the circuit.
4. A capacitor of 50 μF is connected in parallel with a coil having a resistance of 5 Ω and inductance of 400mH. A variable frequency supply of 200 V is given to the circuit.. Find the value of frequency when the current is in phase with voltage. And also find the dynamic impedance and current at this position.
5. An inductive circuit of resistance 4 ohm and inductance 0.02H connected to 100V, 50Hz supply. What capacitance placed in parallel will produce resonance? Find the total current taken from the supply and the current in branch circuit.
6. A 25 Ω resistance is connected in parallel with a coil having inductance of 0.1 H and negligible resistance. This parallel combination is connected in series with a variable capacitor and this total circuit is supply by 230volt 50Hz supply. Find the value of capacitor at the time of resonance.

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Subject: AC CIRCUITS (3330901)

ASSIGNMENT NO: 4

1. Write advantages of 3φ system over single phase system.
2. Explain principle of generation of 3φ voltage.
3. Draw the waveforms of 3 phase A.C. emf.
4. Prove that the vector summation of all the 3φ voltages in 3φ system is zero.
5. Prove that the sum of 3 phase voltages is zero in a balanced 3 Ø A.C. system.
6. Explain the phase sequence in 3 phase A.C. supply. What is its important?
7. Write relationship between line and phase values of voltage and current for star and delta connections in 3φ ac system.
8. Derive the relationship between line and phase values of voltage and current in 3φ star connected system. Also derive the equation of power.
9. Derive the relationship between line and phase value of voltage and current in 3- ϕ delta connected system. Also derive the equation of power.
10. Explain the method to obtain the six phase supply from three phase supply.

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Subject: AC CIRCUITS (3330901)

TUTORIAL NO: 4

1. Three identical impedance of 40- j60 are connected in star across 415 V 3-Φ supply. Calculate1) phase voltage 2) phase current and line current 3) Total active power consumed by circuit.
2. A star connected load draws a 18 A current at lagging p.f. at 500 V and the power consumption is 15 kW. Calculate Find 1) Phase current 2) Phase voltage 3) Impedance 4) Load power factor.
3. A balance three phase delta connected load draws 17.32 A as its line current. If impedance /phase of the load is 40Ω and power factor is 0.8lagging. Calculate supply voltage and power absorbed by the circuit
4. A 3-phase delta connected load is supplied with 3-phase, 440V, 50 Hz supply. A 30 Ω resistor is connected in series with 100 mH inductor in each phase. Calculate (1) phase voltage (2) phase current (3) power factor (4) active power (5) reactive power (6) apparent power.
5. A star connected alternator supplies a delta connected load. The impedance of the load branch is (30+j 40) ohm/phase. The line voltage is 250 V. Determine
   1) Current in the load branch
   2) Power consumed by the load
   3) Power factor of load
   4) Reactive power of the load
6. Each phase of a delta connected load having an impedance of 6 + j 10 Ω is connected to a 400 V. 50 Hz. 3 Ø A.C. supply.
   Calculate 1) Line current 2) Power
7. Three identical coils each having impedance of 12 + j 16 Ω are connected in delta across a 400V, 50Hz. 3 Ø A.C. supply.
   Find: 1) Line current 2) Power input in kW 3) kVA input.

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Subject: : AC CIRCUITS (3330901)

ASSIGNMENT NO: 5

1. Explain Apparent, Active and Reactive power in A.C. circuits.
2. Define the power factor in three distinguish ways.
3. What is power factor? Explain leading and lagging power factors.
4. Explain causes and disadvantages of low power factor.
5. State the advantages of power factor improvement.
6. Define power factor and state its value for pure resistive and pure inductive ac circuit.
7. What is the range of variation of power factor?
8. What do you mean by poor power factor?
9. The apparent power of single phase circuit is 5 KVA and lagging reactive power of 4 KVAr. The circuit is connected with 230 V, 50Hz supply. Find (1) current (2) resistance (3) inductance (4) impedance (5) power factor (6) power consumed.
10. A resistor of 50Ω and an capacitor of 100 μH are connected in series across a 220 V, 50 Hz. A.C. supply. Calculate (i) Apparent power (iii) Active power(iii) Reactive power

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