A.C Circuit

Fundamentals of alternating current

1. The variation of a quantity such as voltage or current shown on a graph is known as _____
   a) Waveform
   b) Peak value
   c) Instantaneous value
   d) Period

2. The variation of a quantity such as voltage or current shown on a graph is known as period – false

3. The variation of a quantity such as voltage or current shown on a graph is known as frequency – false

4. The duration of one cycle known as _____
   a) Waveform
   b) Peak value
   c) Instantaneous value
   d) Period

5. Duration of one cycle known as peak value – false

6. The repetition of a variable quantity, recurring at equal intervals, is known as _____
   a) Waveform
   b) Instantaneous value
   c) Cycle
   d) Period

7. The value of a given waveform at any instant time is termed as _____
   a) Waveform
   b) Instantaneous value
   c) Cycle
   d) Period

8. The maximum instantaneous value measured from zero value is known as?
   a) Peak value
   b) Peak to peak value
   c) Cycle
   d) Period

9. The maximum variation between the maximum positive and the maximum negative value is known as?
   a) Peak value
   b) Peak to peak value
   c) Cycle
   d) Period

10. The value of a given waveform at any instant time is termed as instantaneous value – true

11. Find the average value of current when the current that are equidistant are 4A, 5A and 6A.
   a) 5A
   b) 6A
   c) 15A
   d) 10A

12. The average value of current is the sum of all the currents divided by the number of currents. - true

13. The average value of current is the sum of all the currents multiplied by the number of currents. – false

14. RMS stands for _____
   a) Root Mean Square
   b) Root Mean Sum
   c) Root Maximum sum
   d) Root Minimum Sum

15. RMS stands for Root Mean Sum – false

16. RMS stands for Root Minimum Square – false

17. What is the type of current obtained by finding the square of the currents and then finding their average and then fining the square root?

a) RMS current
b) Average current
c) Instantaneous current
d) Total current

18. RMS value of current is obtained by squaring all the current values, finding the average and then finding the square root. – true

19. What is the effective value of current?
a) RMS current
b) Average current
c) Instantaneous current
d) Total current

20. RMS current is also known as the effective current – true

21. In a sinusoidal wave, average current is always _____ rms current.
a) Greater than
b) Less than
c) Equal to
d) Not related

22. In a sinusoidal wave, RMS current is greater than average current. – true

23. In a sinusoidal wave ,Average current is greater than RMS current – false

24. For a rectangular wave, average current is _____ rms current.
a) Greater than
b) Less than
c) Equal to
d) Not related

25. For a rectangular wave, average and the rms values are the same – true

26. For a rectangular wave, average and the rms values are the different – false

27. Peak value divided by the rms value gives us?
a) Peak factor
b) Crest factor
c) Both peak and crest factor

d) Neither peak nor crest factor

28. Peak and crest factor both mean the same thing. – true

29. Peak value divided by the rms value gives us Average value – false

30. Peak value divided by the rms value gives us peak factor – true

31. Calculate the peak factor if the peak value of current is 10A and the rms value is 2A.
a) 5
b) 10
c) 5A
d) 10A

32. If maximum value of current is $5\sqrt{2}$ A, what will be the value of RMS current?
a) 10 A
b) 5 A
c) 15 A
d) 25 A

33. If Im is the maximum value of a sinusoidal voltage, what is the instantaneous value?
a) $i=Im/2$
b) $i=Im\sin\theta$
c) $i=Im\cos\theta$
d) $i=Im\sin\theta$ or $i=Im\cos\theta$

34. Average value of current over a half cycle is?
a) 0.67Im
b) 0.33Im
c) 6.7Im
d) 3.3Im

35. What is the correct expression for the rms value of current?
a) $Irms=Im/2$
b) $Irms=Im/\sqrt{2}$
c) $Irms=Im/4$
d) $Irms=Im$

36. The expression for the rms value of current is $Irms=Im/\sqrt{2}$ – true

37. The expression for the rms value of current is Irms=Im/2 – false

38. Average value of current over a full cycle is?
    a) 0.67Im
    b) 0
    c) 6.7Im
    d) 3.3Im

39. Average value of current over a full cycle is zero – true

40. What is the correct expression for the form factor?
    a) $I_{rms} * I_{av}$
    b) I_{rms} / I_{av}
    c) $I_{rms} + I_{av}$
    d) $I_{rms} – I_{av}$

41. The correct expression for form factor is I_{rms}/I_{av} - true

42. For a direct current, the rms current is _____ the mean current.
    a) Greater than
    b) Less than
    c) Equal to
    d) Not related to

43. For a direct current, the rms voltage is equal to the mean voltage – true

44. What is the value of the form factor for sinusoidal current?
    a) π/2
    b) π/4
    c) 2π
    d) π/√2

45. For addition and subtraction of phasors, we use the _____ form.
    a) Rectangular
    b) Polar
    c) Either rectangular or polar
    d) Neither rectangular nor polar

46. For addition and subtraction of phasors, we use the rectangular form – true

47. For multiplication and division of phasors, we use _____ form.
    a) Rectangular
    b) Polar
    c) Either rectangular or polar
    d) Neither rectangular nor polar

48. For multiplication and division of phasors, we use the polar form – true

49. If a voltage of 2+5j and another voltage of 3+ 6j flows through two different resistors, connected in series, in a circuit, find the total voltage in the circuit.
    a) 2+5j V
    b) 3+6j V
    c) 5+11j V
    d) 5+10j V

50. Find the total current in the circuit if two currents of 4+5j flow in the circuit.
    a) 4+5j A
    b) 4A
    c) 5A
    d) 8+10j A

Ac series circuit

1. Instantaneous voltage is the product of resistance and _____ current in a resistive circuit.
   a) Instantaneous
   b) Average
   c) RMS
   d) Peak

2. Find the value of the instantaneous voltage if the resistance is 2 ohm and the instantaneous current in the circuit is 5A.
   a) 5V
   b) 2V
   c) 10V
   d) 2.5V

3. The power for a purely resistive circuit is zero when?
   a) Current is zero
   b) Voltage is zero
   c) Both current and voltage are zero
   d) Either current or voltage is zero

4. The power for a purely resistive circuit is zero when either and voltage are zero – false

5. The power for a purely resistive circuit is zero when either current or voltage is zero – true

6. Calculate the resistance in the circuit if the rms voltage is 20V and the rms current is 2A.
   a) 2 ohm
   b) 5 ohm
   c) 10 ohm
   d) 20 ohm

7. The correct expression for the instantaneous current in a resistive circuit is?
   a) i=Vm(sint)/R
   b) i=Vm(cost)/R
   c) i=V(sint)/R
   d) i=V(cost)/R

8. The correct expression for the instantaneous current if instantaneous voltage is Vm(sint) in an inductive circuit is?
   a) $i = Vm(sint)/X_L$
   b) $i = Vm(cost)/X_L$
   c) $i = -Vm(sint)/X_L$
   d) $i = -Vm(cost)/X_L$

9. Inductor does not allow sudden changes in?
   a) Voltage
   b) Current
   c) Resistance
   d) Inductance

10. The inductor does not allow sudden changes in current – true

11. Inductance is _____ to number of turns in the coil.
   a) directly proportional
   b) inversely proportional
   c) equal
   d) not related

12. Inductance is inversely proportional to number of turns in the coil. – true

13. Choke involve use of _____
   a) Resistor
   b) Capacitor
   c) Inductor
   d) Transistor

14. Choke is a type of coil so it involves use of inductor – true

15. Capacitors cannot be used in choke coil- true

16. What is the value of current in an inductive circuit when there is no applied voltage?
   a) Minimum
   b) Maximum
   c) Zero
   d) Cannot be determined

17. The current in an inductive circuit is zero or minimum when the value of the applied voltage is maximum. – true

18. In a pure inductive circuit the voltage leads the current and the current lags the voltage by a phase difference of 90 degrees. – true

19. In an inductive circuit, the voltage_____ the current?
    a) Leads
    b) Lags
    c) Is greater than
    d) Is less than

20. In an inductive circuit, the current_____ the voltage?
    a) Leads
    b) Lags
    c) Is greater than
    d) Is less than

21. In which device inductor cannot be used?
    a) filter circuit
    b) transformer
    c) choke
    d) dielectric

22. A resistance of 7 ohm is connected in series with an inductance of 31.8mH. The circuit is connected to a 100V 50Hz sinusoidal supply. Calculate the current in the circuit.
    a) 2.2A
    b) 4.2A
    c) 6.2A
    d) 8.2A

23. A resistance of 7 ohm is connected in series with an inductance of 31.8mH. The circuit is connected to a 100V 50Hz sinusoidal supply. Calculate the voltage across the resistor.
    a) 31.8V
    b) 57.4V
    c) 67.3V
    d) 78.2V

24. A resistance of 7 ohm is connected in series with an inductance of 31.8mH. The circuit is connected to a 100V 50Hz sinusoidal supply. Calculate the voltage across the inductor.

a) 52V
b) 82V
c) 65V
d) 76V

25. A resistance of 7 ohm is connected in series with an inductance of 31.8mH. The circuit is connected to a x V 50Hz sinusoidal supply. The current in the circuit is 8.2A. Calculate the value of x.
a) 10V
b) 50V
c) 100V
d) 120V

26. Which, among the following, is the correct expression for φ.
a) $\varphi=\tan^{-1}(XL/R)$
b) $\varphi=\tan^{-1}(R/XL)$
c) $\varphi=\tan^{-1}(XL*R)$
d) $\varphi=\cos^{-1}(XL/R)$

27. For a series resistance and inductance circuit the phase angle is always a negative value – true

28. For an RL circuit, the phase angle is always _____
a) Positive
b) Negative
c) 0
d) 90

29. For a series resistance and inductance circuit the phase angle is always a positive value- false

30. What is sinϕ from impedance triangle?
a) X_L/R
b) X_L/Z
c) R/Z
d) Z/R

31. What is the resonance frequency of ac circuit?
a) $1/\sqrt{LC}$
b) $\sqrt{(L/C)}$

c) $\sqrt{LC}$
d) LC

32. What is the value of impedance at resonance?
a) X_L
b) X_C
c) R
d) 0

33. The current is in phase with the voltage when the capacitive reactance is in equal to the inductive reactance. This is known as resonance condition. – trie

34. What is the resonance condition?
a) When $X_L > X_C$
b) When $X_L < X_C$
c) When $X_L = X_C$
d) When X_C=infinity

35. At resonance condition, the frequency is maximum – true

36. Resistance offered to alternating current by inductor or capacitor is known as reactance – true

37. Resistance offered to alternating current by inductor or capacitor is known as conductance – false

38. The combination of resistance and reactance is known as impedance – true

39. The combination of resistance and reactance is known as admittance – false

40. What is the relation between reactance, resistance and impedance?
a) Z=R+jX
b) Z=R+X
c) Z=R-X
d) Z=R-jX

41. The combination of resistance and reactance is known as impedance. Z=R+jX where Z is impedance, R is resistance and X is reactance. R is real part of Z. – true

42. The combination of resistance and reactance is known as impedance. Z=R+jX where Z is impedance, R is resistance and X is reactance. X is imaginary part of Z. – true

43. Only direct current can be stored in the capacitor – true

44. If in an alternating current circuit, resistance is 5 ohm, capacitive reactance is 12 ohm, what is the impedance?
    a) 5 ohm
    b) 10 ohm
    c) 12 ohm
    d) 13 ohm

45. In an RLC circuit, the voltage is always used as a reference – true

46. In an RLC circuit, the power factor is always _____
    a) Positive
    b) Negative
    c) Depends on the circuit
    d) Zero

47. In an RLC series phasor diagram, we start drawing the phasor from the quantity which is common to all three components, that is the current. – true

48. In an RLC series phasor diagram, we start drawing the phasor from the quantity which is common to all three components, that is the voltage. – false

49. Which of the following is not ac waveform?
    a) sinusoidal
    b) square
    c) constant
    d) triangular

50. What is not a frequency for ac current?
    a) 50 Hz
    b) 55 Hz
    c) 0Hz
    d) 60 Hz

AC Parallel circuit

1. In a parallel circuit, we consider _____ instead of impedance.
   a) Resistance
   b) Capacitance
   c) Inductance
   d) Admittance

2. In a parallel circuit, we consider admittance instead of impedance – true

3. In a parallel circuit, we consider reactance instead of impedance – false

4. In a parallel circuit, we consider admittance instead of _____
   a) Resistance
   b) Capacitance
   c) Inductance
   d) Impedance

5. Which, among the following is the correct expression for impedance?
   a) Z=Y
   b) Z=1/Y
   c) $Z=Y^2$
   d) $Z=1/Y^2$

6. We know that impedance is the reciprocal of admittance – true

7. Which, among the following is the correct expression for admittance?
   a) Y=Z
   b) Y=1/Z
   c) $Y=Z^2$
   d) $Y=1/Z^2$

8. We know that admittance is the reciprocal of Reactance – false

9. We know that admittance is the reciprocal of impedance – true

10. What is the unit of admittance?
    a) ohm
    b) henry
    c) farad

d) ohm^{-1}

11. The unit for admittance is ohm^{-1} - true

12. The unit for admittance is ohm – false

13. As the impedance increases, the admittance _____
    a) Increases
    b) Decreases
    c) Remains the same
    d) Becomes zero

14. As the impedance increases, the admittance decreases – true

15. if the impedance of a system is 4 ohm, calculate its admittance.
    a) 0.25 ohm^{-1}
    b) 4 ohm^{-1}
    c) 25 ohm^{-1}
    d) 0.4 ohm^{-1}

16. The admittance of a system is 10 ohm^{-1}, calculate its impedance.
    a) 10 ohm
    b) 0.1 ohm
    c) 1 ohm
    d) 1.1 ohm

17. In A parallel circuit, with any number of impedances, The voltage across each impedance is?
    a) equal
    b) divided equally
    c) divided proportionaly
    d) zero

18. In parallel circuits, the current across the circuits vary whereas the voltage remains the same – true

19. In parallel circuits, the voltage across the circuits vary whereas the current remains the same – false

20. In a parallel circuit, current in each impedance is_____

a) equal

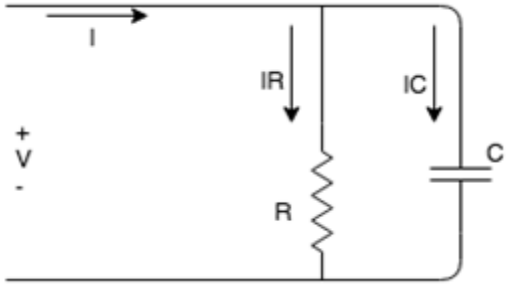
b) different

c) zero

d) infinite

21. In a parallel circuit, current in each impedance is equal – true

22. From the given circuit, find the value of I_R.



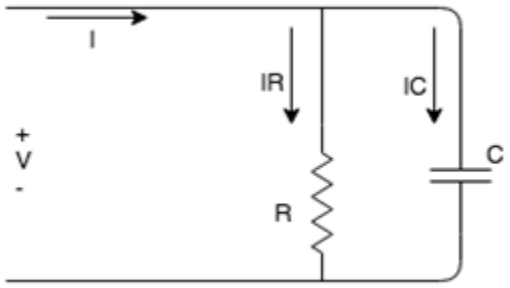
a) 0

b) V/I

c) V/R

d) Cannot be determined

23. What is the relation between I_R and V in the following circuit?



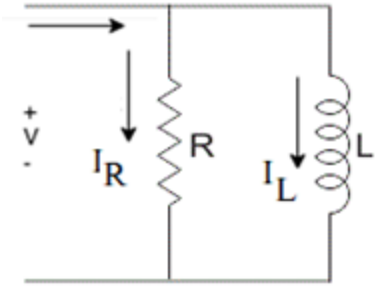
a) I_R leads V

b) I_R lags V

c) I_R and V are in phase

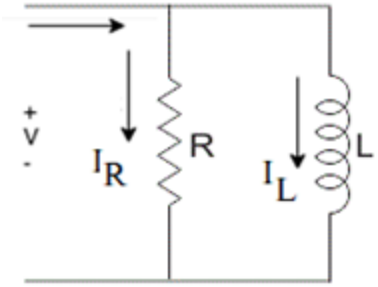
d) No relation

24. What is the expression for the current in the inductor from the following circuit?



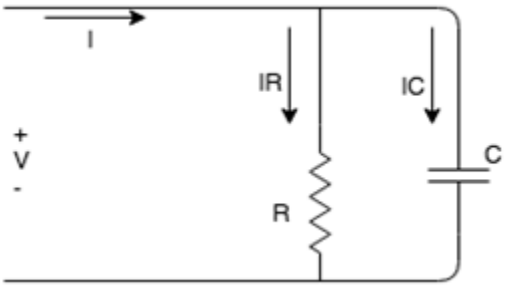
a) V/I
b) V/X_L
c) 0
d) Cannot be determined

25. What is the phase relation between I_L and V from the following circuit?



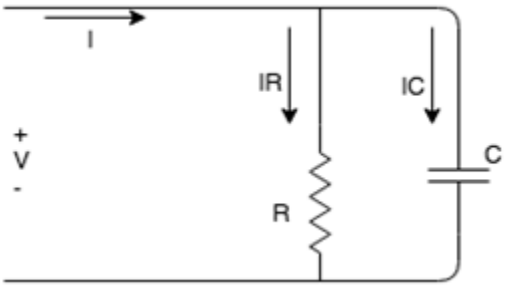
a) I_L lags V
b) I_L leads V
c) I_L and V are in phase
d) No relation

26. Find the expression for the current I from the given circuit.



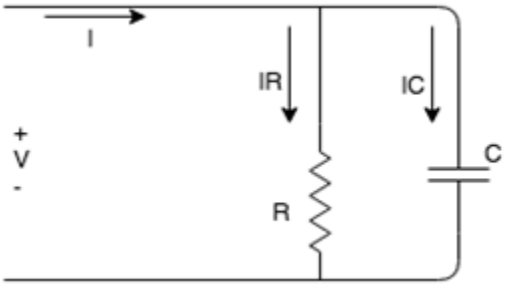
a) $I=I_C$
b) $I=I_R$
c) $I=I_C+I_R$
d) I=0

27. Find the total current if I_C=2A and I_R=5A.



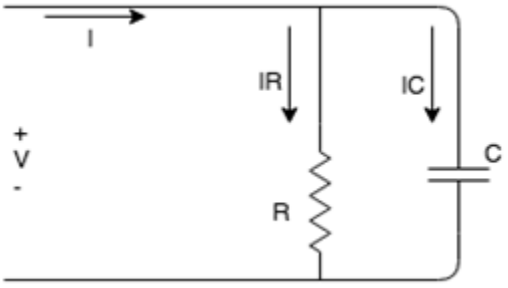
a) 3A
b) -3A
c) 7A
d) 10A

28. Find the value of I_R if I=10A and I_C=8A.



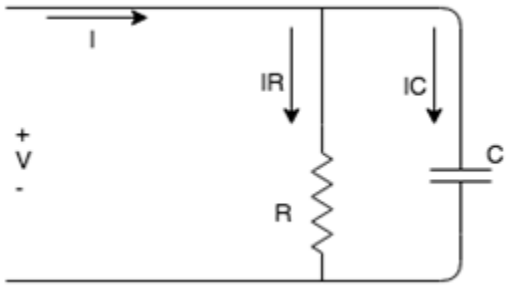
a) 5A
b) 18A
c) 12A
d) 2A

29. Find the value of IL if I_C=10A and I_R=6A.



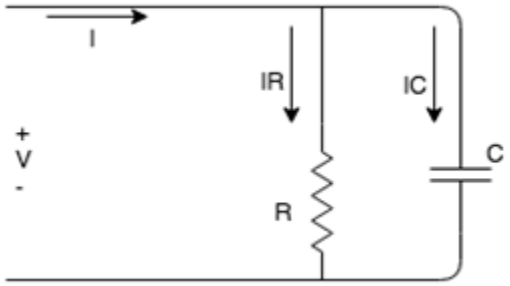
a) 4A
b) 18A
c) 12A
d) 2A

30. What is the expression for the current in the capacitor from the following circuit?



a) V/C
b) V/I
c) 0
d) V/X_C

31. What is the phase relation between I_C and V from the following circuit?



a) I_C lags V
b) I_C leads V
c) I_C and V are in phase
d) No relation

32. In a parallel a.c circuit . power loss in due to conductance alone – true

33. In a parallel a.c circuit . power loss in due to susceptance alone – false

34. Domestic appliances are linked in parallel across a.c. mains as operation of each appliance becomes free of the other – true

35. Domestic appliances are linked in parallel across a.c. mains as it is a simple arrangement – false

36. Domestic appliances are linked in parallel across a.c. mains as it occupies less space. – false

37. The conductance and susceptance components of admittance are series elements – false

38. The conductance and susceptance components of admittance are parallel elements – true

39. The conductance and susceptance components of admittance are series-parallel elements- false

40. The active component in an impedance parallel circuit will _____ the voltage.
    a) Leads
    b) Lags
    c) Be in phase with
    d) Either leads or lags

41. The active component in an impedance parallel network will always be in phase with the voltage in the circuit. – true

42. The quadrature component is also known as?
    a) Active component
    b) Reactive component
    c) Either active or reactive component
    d) Neither active nor reactive component

43. The quadrature component is also known as the reactive component because the reactive component forms a quadrature with the voltage. – true

44. Change in circuit voltage will affect current – true

45. Change in circuit voltage will affect frequency – false

46. In an impedance parallel network the reactive component will either lead or lag the voltage by 90 degrees. – true

47. In an impedance parallel network, the reactive component will _____ the voltage by 90 degrees.
    a) Lead
    b) Lag
    c) Either lead or lag

d) Depends on the circuit

48. In an impedance parallel network the reactive component will lag the voltage by 90 degrees – false

49. In an impedance parallel network, the reactive component will either lead or lag the voltage by _____ degrees.
    a) 0
    b) 90
    c) 45
    d) 180

50. In an impedance parallel network the reactive component will either lead or lag the voltage by 90 degrees. – true

Poly phase circuit

1. The power generated by a machine increases _____ percent from single phase to two phase.
   a) 40.4
   b) 41.4
   c) 42.4
   d) 43.4

2. The power generated by machine increases 41.4 percent from single phase to two phase. – true

3. The power generated by machine increases 44.1 percent from single phase to two phase. –false

4. In an ac system it is possible to connect two or more number of individual circuits to a common poly phase source – true

5. In an ac system it is not possible to connect two or more number of individual circuits to a common poly phase source – false

6. The percentage of power increased from single phase to three phase is?
   a) 50
   b) 100
   c) 150
   d) 200

7. The percentage of power increased from single phase to three phase is 50%- true

8. Beyond three phase the maximum possible increase is only seven percent but the complications are many.- true

9. The percentage of power increased from single phase to three phase is 70% - false

10. Beyond three phase the maximum possible increase is only two percent but the complications are many- false

11. When the power factor is _____ the power becomes zero 100 times a second in a 50Hz supply.
    a) 0
    b) 1

c) 2
d) 3

12. The power in a single phase circuit is pulsating – true

13. When the power factor is one, the power becomes zero 100 times a second in a 50Hz supply. Therefore single phase motors have a pulsating torque. – true

14. Three phase motors are more easily started than single phase motors – true

15. Single phase motors are more easily started than three phase motors- false

16. Three phase motors are called self-starting motors.- true

17. Which motors are called self-starting motors?
    a) single phase
    b) two phase
    c) three phase
    d) four phase

18. Single phase or two phase or four phase motors are not called self-starting motors. – true

19. In three phase system, the three voltages (currents) differ in phase by _____electrical degrees from each other in a particular sequence.
    a) 30
    b) 60
    c) 90
    d) 120

20. In general a three phase system of voltages is merely a combination of three single phase systems of voltages - true

21. In three phase system, the three voltages (currents) differ in phase by 60º from each other in a particular sequence. – false

22. In three phase system at any given instant, the algebraic sum of three voltages must be?
    a) 0
    b) 1
    c) 2

d) 3

23. Algebraic sum of three voltages = 0. – true

24. Phase sequence depends on the?
    a) field
    b) rotation of the field
    c) armature
    d) rotation of the armature

25. The sequence of voltages in the three phases undergo changes one after the other abd this is called phase sequence. – true

26. Phase sequence depends on the rotation of the field not on rotation of armature or on field or on armature. – true

27. If RR', YY' and BB' constitutes three phase sequence if $V'_{RR} = V_m \sin\omega t$ its corresponding field magnets are in clockwise direction, then V'_{YY} =?
    a) $V_m \sin\omega t$
    b) $V_m \sin(\omega t+120^o)$
    c) $V_m \sin(\omega t-120^o)$
    d) $V_m \sin(\omega t-240^o)$

28. If RR', YY' and BB' constitutes three phase sequence if $V'_{RR} = V_m \sin\omega t$ its corresponding field magnets are in clockwise direction ,V'_{BB} ?
    a) $V_m \sin(\omega t-240^o)$
    b) $V_m \sin(\omega t-120^o)$
    c) $V_m \sin(\omega t+240^o)$
    d) $V_m \sin\omega t$

29. Polyphase System is a combination of two or more than two voltages having same magnitude and frequency but displaced from each other by an equal electrical angle. – true

30. The angular displacement between the adjacent voltages is called a Phase Difference and depends upon the number of phases.- true

31. Polyphase or we can say Three Phase System is universally adopted for a generation, transmission and distribution of electric power – true

32. 3 Phase system requires more copper and aluminium for the transmission system in comparison to a single phase transmission system. – false

33. Three phase circuit is the polyphase system where three phases are send together from the generator to the load. – true

34. The power in three phase system is continuous as all the three phases are involved in generating the total power. – true

35. In unbalance system the magnitude of voltage in all the three phases becomes different. – true

36. In unbalance system the magnitude of voltage in all the three phases becomes same.- false

37. In wye or star connection, _____ of the three phases are joined together within the alternator.
    a) similar ends
    b) opposite ends
    c) one similar end, two opposite ends
    d) one opposite end, two opposite ends

38. The voltage between _____ and _____ is called phase voltage.
    a) line and line
    b) line and reference
    c) neutral point and reference
    d) line and neutral point

39. The voltage between line and line is called phase voltage. – false

40. the voltage between line and line is called line voltage.- true

41. The voltage between line and neutral point is called phase voltage. – true

42. The voltage between line and neutral point is called line voltage. – false

43. The voltage between _____ is called line voltage.
    a) line and neutral point
    b) line and reference
    c) line and line

d) neutral point and reference

44. The currents flowing through the phases are called the phase currents – true

45. The currents flowing through the phases are called the line currents-false

46. In the Delta or Mesh connection, there will be _____ number of common terminals.
    a) 1
    b) 2
    c) 3
    d) 0

47. In the Delta or Mesh connection, there will be zero number of common terminals. – true

48. In the Delta or Mesh connection, there will be one number of common terminals.- false

49. The relation between line voltage and phase voltage in Delta or Mesh connection is?
    a) $V_{phase} > V_{line}$
    b) $V_{phase} < V_{line}$
    c) $V_{phase} = V_{line}$
    d) $V_{phase} >= V_{line}$

50. Which of the following voltage is a phase voltage in delta connection?
    a) V_{RN}
    b) V_{BR}
    c) V_{YN}
    d) V_{BN}

Power measurement in ac networks

1. The equation of the average power (P_{avg}) is?
   a) $(V_m I_m/2)\cos\theta$
   b) $(V_m I_m/2)\sin\theta$
   c) $V_m I_m \cos\theta$
   d) $V_m I_m \sin\theta$

2. Average power (P_{avg}) =?
   a) $V_{eff} I_m \cos\theta$
   b) $V_{eff} I_{eff} \cos\theta$
   c) $V_m I_m \cos\theta$
   d) $V_m I_{eff} \cos\theta$

3. To get average power we have to take the product of the effective values of both voltage and current multiplied by cosine of the phase angle between the voltage and current. - true

4. In case of purely resistive circuit, the average power is?
   a) $V_m I_m$
   b) $V_m I_m/2$
   c) $V_m I_m/4$
   d) $V_m I_m/8$

5. In case of purely resistive circuit, the phase angle between the voltage and current is zero – true

6. In case of purely capacitive circuit, average power = ____ and θ=___
   a) 0, 0º
   b) 1, 0º
   c) 1, 90º
   d) 0, 90º

7. In case of purely capacitive circuit, the phase angle between the voltage and current is 90º - true

8. In case of purely capacitive circuit, the phase angle between the voltage and current is 120º - false

9. In case of purely resistive circuit, the phase angle between the voltage and current is 90º- false

10. In case of purely inductive circuit, average power = ____ and θ=___
    a) 0, 90º
    b) 1, 90º
    c) 1, 0º
    d) 0, 0º

11. If a circuit has complex impedance, the average power is _____
    a) power stored in inductor only
    b) power stored in capacitor only
    c) power dissipated in resistor only
    d) power stored in inductor and power dissipated in resistor

12. If a circuit has complex impedance, the average power is power dissipated in resistor only and is not stored in capacitor or inductor.- true

13. A voltage v (t) = 100sinωt is applied to a circuit. The current flowing through the circuit is i(t) = 15sin(ωt-30º). Find the effective value of voltage.
    a) 70
    b) 71
    c) 72
    d) 73

14. A voltage v (t) = 100sinωt is applied to a circuit. The current flowing through the circuit is i(t) = 15sin(ωt-30º). Find the effective value of current
    a) 9
    b) 10
    c) 11
    d) 12

15. Determine the average power delivered to the circuit consisting of an impedance Z = 5+j8 when the current flowing through the circuit is I = 5∠30º.
    a) 61.5
    b) 62.5
    c) 63.5
    d) 64.5

16. The highest power factor will be?
    a) 1
    b) 2
    c) 3

d) 4

17. The power factor is useful in determining the useful power transferred to a load. – true

18. If power factor = 1, then the current to the load is _____ with the voltage across it.
    a) out of phase
    b) in phase
    c) 90º out of phase
    d) 45º out of phase

19. If power factor = 1, then the current to the load is in phase with the voltage across it –true

20. If power factor = 0, then the current to the load is in phase with the voltage across it- false

21. In case of resistive load, the power factor =?
    a) 4
    b) 3
    c) 2
    d) 1

22. In case of resistive load, the power factor = 1 as the current to the load is in phase with the voltage across it. – true

23. In case of resistive load, the power factor = 0.5 as the current to the load is in phase with the voltage across it.- false

24. If power factor = 0, then the current to a load is _____ with the voltage.
    a) in phase
    b) out of phase
    c) 45º out of phase
    d) 90º out of phase

25. If the power factor = 0, then the current to a load is 90º out of phase with the voltage and it happens in case of reactive load. – true

26. If the power factor = 0, then the current to a load is 90º out of phase with the voltage and it happens in case of resistive load.- false

27. For reactive load, the power factor is equal to?
    a) 0

b) 1
c) 2
d) 3

28. Average power is also called?
a) apparent power
b) reactive power
c) true power
d) instantaneous power

29. Average power is also called apparent power – false

30. Average power is also called reactive power –false

31. Average power is also called active power – true

32. If we apply a sinusoidal voltage to a circuit, the product of voltage and current is?
a) true power
b) apparent power
c) average power
d) reactive power

33. The apparent power is expressed in volt amperes - true

34. The active power is expressed in volt amperes – false

35. The power factor=?
a) $\sin\theta$
b) $\cos\theta$
c) $\tan\theta$
d) $\sec\theta$

36. As the phase angle between the voltage and the current increases the power factor decreases. – true

37. As the phase angle between the voltage and the current increases the power factor increases. – false

38. The power factor is the ratio of _____ power to the _____ power.
a) average, apparent

b) apparent, reactive
c) reactive, average
d) apparent, average

39. The power factor is the ratio of average power to the apparent power.- true

40. The power factor is the ratio of apparent power to the average power – false

41. The power factor is called leading power factor in case of ____ circuits.
a) LC
b) RC
c) RL
d) RLC

42. The term lagging power factor is used in which circuits?
a) RLC
b) RC
c) RL
d) LC

43. The power factor is called leading power factor in case of RL circuits- false

44. The power factor is called leading power factor in case of RC circuits – true

45. The term lagging power factor is used in RL circuits – true

46. Reactive power is expressed in?
a) Watts (W)
b) Volt Amperes Reactive (VAR)
c) Volt Ampere (VA)
d) No units

47. Reactive power is expressed in Volt Amperes Reactive (VAR) – true

48. The reactive power equation (P_r) is?
a) I_{eff}^2 (ωL)sin2(ωt+θ)
b) I_{eff}^2 (ωL)cos2(ωt+θ)
c) I_{eff}^2 (ωL)sin(ωt+θ)
d) I_{eff}^2 (ωL)cos(ωt+θ)

49. The term lagging power factor is used in RC circuits – false

50. A sinusoidal voltage v = 50sinωt is applied to a series RL circuit. The current in the circuit is given by I = 25sin (ωt-53º). Determine the apparent power (VA).
    a) 620
    b) 625
    c) 630
    d) 635

Three phase circuit with unbalance load

1. If the system is a three-wire system, the currents flowing towards the load in the three lines must add to ___ at any given instant.
   a) 1
   b) 2
   c) 3
   d) zero

2. If the system is a three-wire system, the currents flowing towards the load in the three lines must add to zero at any given instant. – true

3. If the system is a three-wire system, the currents flowing towards the load in the three lines must add to maximum at any given instant. – false

4. The three impedances $Z_1 = 20\angle 30^{o}\Omega$, $Z_2 = 40\angle 60^{o}\Omega$, $Z_3 = 10\angle -90^{o}\Omega$ are delta-connected to a 400V, 3 – Ø system. Determine the phase current I_R.
   a) (17.32-j10) A
   b) (-17.32-j10) A
   c) (17.32+j10) A
   d) (-17.32+j10) A

5. The three impedances $Z_1 = 20\angle 30^{o}\Omega$, $Z_2 = 40\angle 60^{o}\Omega$, $Z_3 = 10\angle -90^{o}\Omega$ are delta-connected to a 400V, 3 – Ø system. Find the phase current I_Y.
   a) (10-j0) A
   b) (10+j0) A
   c) (-10+j0) A
   d) (-10-j0) A

6. The three impedances $Z_1 = 20\angle 30^{o}\Omega$, $Z_2 = 40\angle 60^{o}\Omega$, $Z_3 = 10\angle -90^{o}\Omega$ are delta-connected to a 400V, 3 – Ø system. Find the phase current I_B.
   a) (34.64-j20) A
   b) (34.64+j20) A
   c) (-34.64+j20) A
   d) (-34.64-j20) A

7. The three impedances $Z_1 = 20\angle 30^{o}\Omega$, $Z_2 = 40\angle 60^{o}\Omega$, $Z_3 = 10\angle -90^{o}\Omega$ are delta-connected to a 400V, 3 – Ø system, find the line current I_1.
   a) (-51.96-j10) A
   b) (-51.96+j10) A
   c) (51.96+j10) A

d) (51.96+j10) A

8. The three impedances $Z_1 = 20\angle 30^{o}\Omega$, $Z_2 = 40\angle 60^{o}\Omega$, $Z_3 = 10\angle -90^{o}\Omega$ are delta-connected to a 400V, 3 – Ø system, find the line current I_2.
   a) (-27.32+j10) A
   b) (27.32+j10) A
   c) (-27.32-j10) A
   d) (27.32-j10) A

9. The three impedances $Z_1 = 20\angle 30^{o}\Omega$, $Z_2 = 40\angle 60^{o}\Omega$, $Z_3 = 10\angle -90^{o}\Omega$ are delta-connected to a 400V, 3 – Ø system, find the line current I_3.
   a) (24.646+j20) A
   b) (-24.646+j20) A
   c) (-24.646-j20) A
   d) (24.646-j20) A

10. The term power is defined as the product of square of current and the impedance- true

11. The term power is defined as the product of square of voltage and the impedance- false

12. The term power is defined as the product of square of current and the reactance – false

13. If the load impedance is $Z\angle Ø$, the current (I_R) is?
   a) $(V/Z)\angle -Ø$
   b) $(V/Z)\angle Ø$
   c) $(V/Z)\angle 90-Ø$
   d) $(V/Z)\angle -90+Ø$

14. If a resistor Z_R is connected between R and N, Z_{BR} between R and B, Z_{RY} between R and Y and Z_{BY} between B and Y form a delta connection, then after transformation to star, the impedance at R is?
   a) $(Z_{BR}Z_{BY})/(Z_{RY}+Z_{BY}+Z_{BR})$
   b) $(Z_{RY}Z_{BR})/(Z_{RY}+Z_{BY}+Z_{BR})$
   c) $(Z_{RY}Z_{BY})/(Z_{RY}+Z_{BY}+Z_{BR})$
   d) $(Z_{RY})/(Z_{RY}+Z_{BY}+Z_{BR})$

15. If a resistor Z_R is connected between R and N, Z_{BR} between R and B, Z_{RY} between R and Y and Z_{BY} between B and Y form a delta connection, then after transformation to star, the impedance at Y is?
   a) $(Z_{BR}Z_{BY})/(Z_{RY}+Z_{BY}+Z_{BR})$

b) $(Z_{RY}Z_{BR})/(Z_{RY}+Z_{BY}+Z_{BR})$
c) $(Z_{RY}Z_{BY})/(Z_{RY}+Z_{BY}+Z_{BR})$
d) $(Z_{RY})/(Z_{RY}+Z_{BY}+Z_{BR})$

16. If a resistor Z_R is connected between R and N, Z_{BR} between R and B, Z_{RY} between R and Y and Z_{BY} between B and Y form a delta connection, then after transformation to star, the impedance at B is?
a) $(Z_{BR}Z_{BY})/(Z_{RY}+Z_{BY}+Z_{BR})$
b) $(Z_{RY}Z_{BR})/(Z_{RY}+Z_{BY}+Z_{BR})$
c) $(Z_{RY}Z_{BY})/(Z_{RY}+Z_{BY}+Z_{BR})$
d) $(Z_{RY})/(Z_{RY}+Z_{BY}+Z_{BR})$

17. If the resistors of star connected system are Z_R, Z_Y, Z_B then the impedance Z_{RY} in delta connected system will be?
a) $(Z_RZ_Y+ Z_YZ_B+ Z_BZ_R)/Z_B$
b) $(Z_RZ_Y+ Z_YZ_B+ Z_BZ_R)/Z_Y$
c) $(Z_RZ_Y+ Z_YZ_B+ Z_BZ_R)/Z_R$
d) $(Z_RZ_Y+ Z_YZ_B+ Z_BZ_R)/(Z_R+Z_Y)$

18. After transformation to delta, the impedance Z_{RY} in delta connected system will be $(Z_RZ_Y+ Z_YZ_B+ Z_BZ_R)/Z_B$. – true

19. If the resistors of star connected system are Z_R, Z_Y, Z_B then the impedance Z_{BY} in delta connected system will be?
a) $(Z_RZ_Y+ Z_YZ_B+ Z_BZ_R)/(Z_B+Z_Y)$
b) $(Z_RZ_Y+ Z_YZ_B+ Z_BZ_R)/Z_B$
c) $(Z_RZ_Y+ Z_YZ_B+ Z_BZ_R)/Z_Y$
d) $(Z_RZ_Y+ Z_YZ_B+ Z_BZ_R)/Z_R$

20. After transformation to delta, the impedance Z_{BY} in delta connected system will be (Z_R $(Z_RZ_Y+ Z_YZ_B+ Z_BZ_R)/Z_R$. – true

21. If the resistors of star connected system are Z_R, Z_Y, Z_B then the impedance Z_{BR} in delta connected system will be?
a) $(Z_RZ_Y+ Z_YZ_B+ Z_BZ_R)/Z_Y$
b) $(Z_RZ_Y+ Z_YZ_B+ Z_BZ_R)/_R$
c) $(Z_RZ_Y+ Z_YZ_B+ Z_BZ_R)/Z_B$
d) $(Z_RZ_Y+ Z_YZ_B+ Z_BZ_R)/(Z_B+Z_R)$

22. If a star connected system has equal impedances Z_1, then after converting into delta connected system having equal impedances Z_2, then?
    a) $Z_2 = Z_1$
    b) $Z_2 = 2Z_1$
    c) $Z_2 = 3Z_1$
    d) $Z_2 = 4Z_1$

23. If a star connected system has equal impedances Z_1, then after converting into delta connected system having equal impedances Z_2, then $Z_2 = 3Z_1$. – true

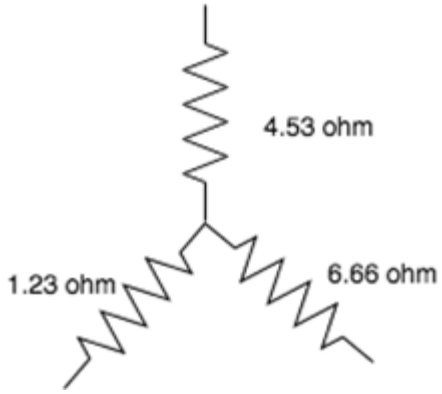
24. If a star connected system has equal impedances Z_1, then after converting into delta connected system having equal impedances Z_2, then $Z_2 = Z_1$. – false

25. A symmetrical three-phase, three-wire 440V supply is connected to star-connected load. The impedances in each branch are $Z_R = (2+j3)\ \Omega$, $Z_Y = (1-j2)\ \Omega$, $Z_B = (3+j4)\ \Omega$. Find Z_{RY}.
    a) (5.22-j0.82) Ω
    b) (-3.02+j8) Ω
    c) (3.8-j0.38) Ω
    d) (-5.22+j0.82) Ω

26. A symmetrical three-phase, three-wire 440V supply is connected to star-connected load. The impedances in each branch are $Z_R = (2+j3)\ \Omega$, $Z_Y = (1-j2)\ \Omega$, $Z_B = (3+j4)\ \Omega$. Find Z_{BY}.
    a) (5.22-j0.82) Ω
    b) (-3.02+j8) Ω
    c) (3.8-j0.38) Ω
    d) (-5.22+j0.82) Ω

27. A symmetrical three-phase, three-wire 440V supply is connected to star-connected load. The impedances in each branch are $Z_R = (2+j3)\ \Omega$, $Z_Y = (1-j2)\ \Omega$, $Z_B = (3+j4)\ \Omega$. Find Z_{BR}.
    a) (5.22-j0.82) Ω
    b) (-3.02+j8) Ω
    c) (3.8-j0.38) Ω
    d) (-5.22+j0.82) Ω

28. Find the equivalent delta circuit.



a) 9.69 ohm, 35.71 ohm, 6.59 ohm
b) 10.69 ohm, 35.71 ohm, 6.59 ohm
c) 9.69 ohm, 34.71 ohm, 6.59 ohm
d) 10.69 ohm, 35.71 ohm, 7.59 ohm

29. Which, among the following is the correct expression for star-delta conversion?
a) R1=Ra*Rb/(Ra+Rb+Rc), R2=Rb*Rc/(Ra+Rb+Rc), R3=Rc*Ra/(Ra+Rb+Rc)b)
b) R1=Ra/(Ra+Rb+Rc), R2=Rb/(Ra+Rb+Rc), Rc=/(Ra+Rb+Rc)
c) R1=Ra+Rb+Ra*Rb/Rc, R2=Rc+Rb+Rc*Rb/Ra, R3=Ra+Rc+Ra*Rc/Rb
d) R1=Ra*Rb/Rc, R2=Rc*Rb/Ra, R3=Ra*Rc/Rb

30. After converting to delta, each delta connected resistance is equal to the sum of the two resistance it is connected to+product of the two resistances divided by the remaining resistance. – true

31. For star to delta connection , R1=Ra*Rb/(Ra+Rb+Rc), R2=Rb*Rc/(Ra+Rb+Rc), R3=Rc*Ra/(Ra+Rb+Rc)b) – false

32. Delta connection is also known as_____
a) Y-connection
b) Mesh connection
c) Either Y-connection or mesh connection
d) Neither Y-connection nor mesh connection

33. Delta connection is also known as Y connection – false

34. Ra is resistance at A, Rb is resistance at B, Rc is resistance at C in star connection. After transforming to delta, what is resistance between B and C?
a) Rc+Rb+Rc*Rb/Ra
b) Rc+Rb+Ra*Rb/Rc

c) Ra+Rb+Ra*Rc/Rb
d) Rc+Rb+Rc*Ra/Rb

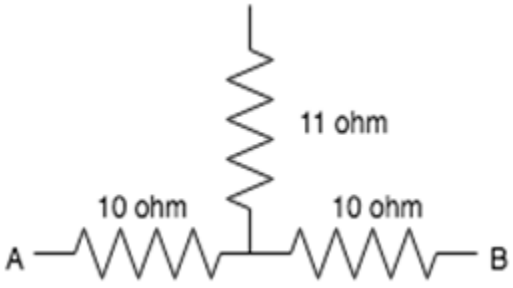
35. Ra is resistance at A, Rb is resistance at B, Rc is resistance at C in star connection. After transforming to delta, what is resistance between A and C?
a) Ra+Rb+Ra*Rb/Rc
b) Ra+Rc+Ra*Rc/Rb
c) Ra+Rb+Ra*Rc/Ra
d) Ra+Rc+Ra*Rb/Rc

36. Ra is resistance at A, Rb is resistance at B, Rc is resistance at C in star connection. After transforming to delta, what is resistance between A and B?
a) Rc+Rb+Ra*Rb/Rc
b) Ra+Rb+Ra*Rc/Rb
c) Ra+Rb+Ra*Rb/Rc
d) Ra+Rc+Ra*Rc/Rb

37. If a 1ohm 2ohm and 32/3ohm resistor is connected in star, find the equivalent delta connection.
a) 34 ohm, 18.67 ohm, 3.19 ohm
b) 33 ohm, 18.67 ohm, 3.19 ohm
c) 33 ohm, 19.67 ohm, 3.19 ohm
d) 34 ohm, 19.67 ohm, 3.19 ohm

38. If an 8/9ohm, 4/3ohm and 2/3ohm resistor is connected in star, find its delta equivalent.
a) 4ohm, 3ohm, 2ohm
b) 1ohm, 3ohm, 2ohm
c) 4ohm, 1ohm, 2ohm
d) 4ohm, 3ohm, 1ohm

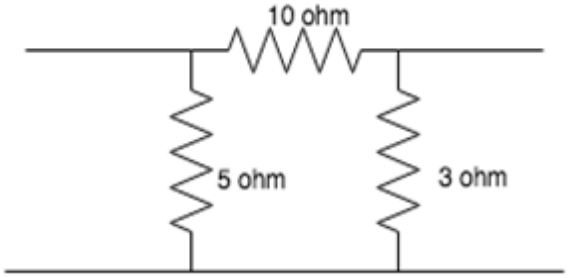
39. Find the equivalent resistance between A and B.



a) 32ohm
b) 31ohm
c) 30ohm

d) 29ohm

40. The value of the 3 resistances when connected in star connection is_____



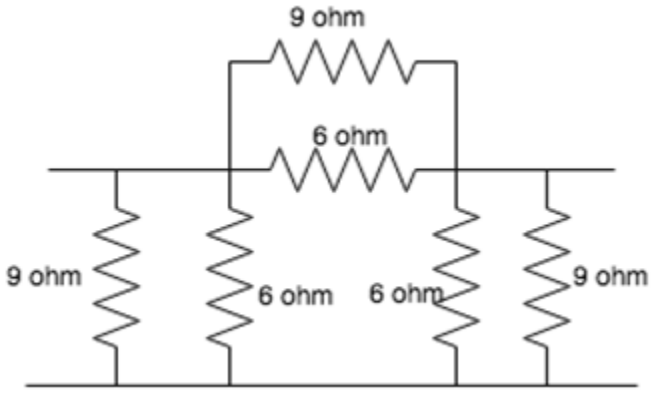
a) 2.32ohm,1.22ohm, 4.54ohm
b) 3.55ohm, 4.33ohm, 5.67ohm
c) 2.78ohm, 1.67ohm, 0.83ohm
d) 4.53ohm, 6.66ohm, 1.23ohm

41. Which, among the following is the right expression for converting from delta to star?
a) R1=Ra*Rb/(Ra+Rb+Rc), R2=Rb*Rc/(Ra+Rb+Rc), R3=Rc*Ra/(Ra+Rb+Rc)
b) R1=Ra/(Ra+Rb+Rc), R2=Rb/(Ra+Rb+Rc), Rc=/(Ra+Rb+Rc)
c) R1=Ra*Rb*Rc/(Ra+Rb+Rc), R2=Ra*Rb/(Ra+Rb+Rc), R3=Ra/(Ra+Rb+Rc)
d) R1=Ra*Rb*Rc/(Ra+Rb+Rc), R2=Ra*Rb*Rc/(Ra+Rb+Rc), R3=Ra*Rb*Rc/(Ra+Rb+Rc)

42. After converting to star, each star connected resistance is equal to the ratio of product of the resistances it is connected to and the total sum of the resistances.- true

43. From delta to star conversion , R1=Ra*Rb/(Ra+Rb+Rc), R2=Rb*Rc/(Ra+Rb+Rc), R3=Rc*Ra/(Ra+Rb+Rc) – true

44. Find the equivalent star network.



a) 2.3ohm, 2.3ohm, 2.3ohm
b) 1.2ohm, 1.2ohm, 1.2ohm

c) 3.3ohm, 3.3ohm, 3.3ohm
d) 4.5ohm, 4.5ohm, 4.5ohm

45. Star connection is also known as_____
a) Y-connection
b) Mesh connection
c) Either Y-connection or mesh connection
d) Neither Y-connection nor mesh connection

46. Star connection is also known as Mesh connection – false

47. Rab is the resistance between the terminals A and B, Rbc between B and C and Rca between C and A. These 3 resistors are connected in delta connection. After transforming to star, the resistance at A will be?
a) Rab*Rac/(Rab+Rbc+Rca)
b) Rab/(Rab+Rbc+Rca)
c) Rbc*Rac/(Rab+Rbc+Rca)
d) Rac/(Rab+Rbc+Rca)

48. Rab is the resistance between the terminals A and B, Rbc between B and C and Rca between C and A. These 3 resistors are connected in delta connection. After transforming to star, the resistance at B will be?
a) Rac/(Rab+Rbc+Rca)
b) Rab/(Rab+Rbc+Rca)
c) Rbc*Rab/(Rab+Rbc+Rca)
d) Rab/(Rab+Rbc+Rca)

49. Rab is the resistance between the terminals A and B, Rbc between B and C and Rca between C and A. These 3 resistors are connected in delta connection. After transforming to star, the resistance at C will be?
a) Rac/(Rab+Rbc+Rca)
b) Rab/(Rab+Rbc+Rca)
c) Rbc*Rac/(Rab+Rbc+Rca)
d) Rab/(Rab+Rbc+Rca)

50. If a 6 ohm, 2ohm and 4ohm resistor is connected in delta, find the equivalent star connection.
a) 1ohm, 2ohm, 3ohm
b) 2ohm, 4ohm, 7ohm

c) 5ohm, 4ohm, 2ohm
d) 1ohm, 2ohm, 2/3ohm