Subject: - Electrical Circuits (22324)

SYLLABUS

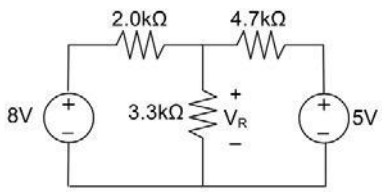
Chapter No.	Name of chapter	Marks With Option
1	Single phase AC series circuit	22
2	Single phase AC parallel circuit	20
3	Three phase Circuits	20
4	Network reduction and principles of DC circuits analysis	16
5	Network Theorems	24
	Total Marks :-	102

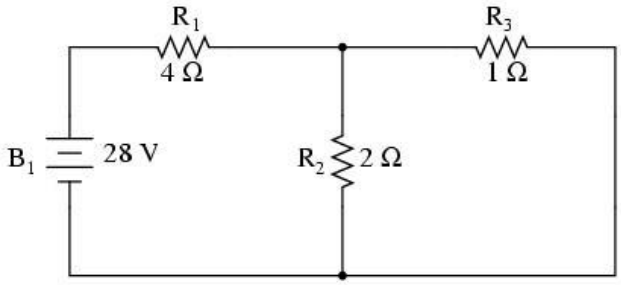
BOARD THEORY PAPER PATTERN

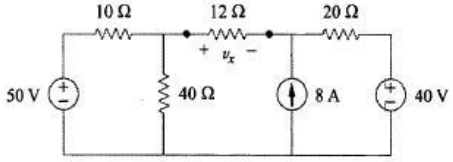
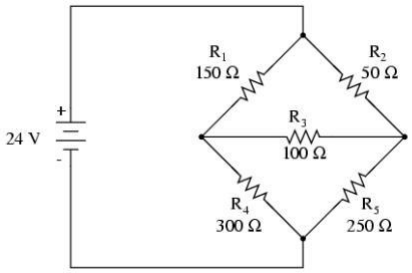
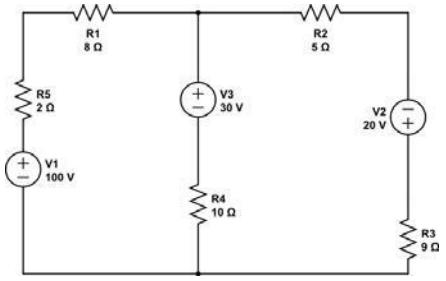
Q.1		**Attempt any FIVE** **5*2=10**	
		Single phase AC series circuit	**CO-324.01**
	b)	**Single phase AC series circuit**	**CO-324.01**
	c)	**Single phase AC parallel circuit**	**CO-324.02**
	d)	**Three phase Circuits**	**CO-324.03**
	e)	**Network reduction and principles of DC circuits analysis**	**CO-324.04**
	f)	**Network Theorems**	**CO-324.05**
	g)	**Network Theorems**	**CO-324.05**
Q.2		**Attempt any THREE 3*4=12**	
		Single phase AC series circuit	**CO-324.01**
	b)	**Single phase AC parallel circuit**	**CO-324.02**
	c)	**Three phase Circuits**	**CO-324.03**
	d)	**Network reduction and principles of DC circuits analysis**	**CO-324.04**
Q.3		**Attempt any THREE 3*4=12**	
		Single phase AC series circuit	**CO-324.01**
	b)	**Single phase AC parallel circuit**	**CO-324.02**
	c)	**Three phase Circuits**	**CO-324.03**
	d)	**Network reduction and principles of DC circuits analysis**	**CO-324.04**
	e)	**Network Theorems**	**CO-324.05**
Q.4		**Attempt any THREE 3*4=12**	
		Single phase AC series circuit	**CO-324.01**
	b)	**Single phase AC parallel circuit**	**CO-324.02**
	c)	**Three phase Circuits**	**CO-324.03**
	d)	**Network Theorems**	**CO-324.05**
Q.5		**Attempt any TWO 2*6=12**	
		Single phase AC parallel circuit	**CO-324.02**

	b)	**Network reduction and principles of DC circuits analysis**	**CO-324.04**
	c)	**Network Theorems**	**CO-324.05**
Q.6		**Attempt any TWO 2*6=12**	
		Single phase AC series circuit	**CO-324.01**
	b)	**Three phase Circuits**	**CO-324.03**
	c)	**Network Theorems**	**CO-324.05**

SAMPLE QUESTION PAPER

Q.1		**Attempt any FIVE** **5*2=10**	
	a)	Draw impedance triangle for R-C series circuit. Write nature of power factor of this circuit.	**CO-324.01**
	b)	Define impedance and reactance related to single phase AC series circuit. Give the units of both.	**CO-324.01**
	c)	Define admittance with unit.	**CO-324.02**
	d)	Draw the sinusoidal waveform of 3-phase emf and also indicate the phase sequence.	**CO-324.03**
	e)	Give four steps to solve mesh analysis.	**CO-324.04**
	f)	State Superposition Theorem.	**CO-324.05**
	g)	State the maximum power transfer theorem for DC circuit.	**CO-324.05**
Q.2		**Attempt any THREE 3*4=12**	
	a)	Find active, reactive and apparent power and power factor of the A.C. Series circuit consisting of R=1 ohm, L=0.001 Henry and C= 1 microfarad supplied with 100 volt, 50 Hz power supply.	**CO-324.01**
	b)	A voltage of 200 ∠ 53° is applied across two impedances in parallel. The values of impedances are (12 + j16) and (10 – j20). Determine the kVA, kVAR and kW in each branch and power factor of the whole circuit.	**CO-324.02**
	c)	A delta connected induction motor is supplied by 3-phase, 400V, 50Hz supply the line current is 43.3A and the total power taken from the supply is 24 kW. Find the resistance and reactance per phase of motor winding	**CO-324.03**
	d)	Using mesh analysis find values of VR as shown in Figure No. 1  Fig. 1.	**CO-324.04**
Q.3		**Attempt any THREE 3*4=12**	
	a)	A coil of resistance 50 Ω and inductance of 0.1 H is connected in series with 100 mF capacitor. The combination is supplied with 230 V, 50 Hz	**CO-324.01**

		A.C. supply. Calculate voltage across each, current through the circuit, power factor and draw complete vector diagram.	
	b)	Two impedances (12 + j16) and (10-j20) Ω are connected in parallel across a supply of $200\angle 60^0$ using admittance method calculate branch currents, total current and power factor of whole circuit.	**CO-324.02**
	c)	Give four advantages of polyphase circuits over 1-phase circuits.	**CO-324.03**
	d)	Give the expression for star to delta and delta to star transformation.	**CO-324.04**
	e)	Using Norton's theorem, find current through 1ohm resistances in Figure No. 2.  Fig.2	**CO-324.05**
Q.4		**Attempt any THREE 3*4=12**	
	a)	An inductive coil (10 + j40) Ω impedance is connected in series with a capacitor of 100 µF across 230 V, 50 Hz, 1-Phase supply mains find : (1) Current through the circuit (2) P.F. of the circuit (3) Power dissipated in the circuit (4) Draw phasor diagram	**CO-324.01**
	b)	A coil having resistance of 5 Ω and inductance of 0.2H is arranged in parallel with another coil having resistance of 1 Ω and inductance of 0.08 H. Calculate the current through the combination and power absorbed when a voltages of 100 V, 50 Hz is applied. Use impedance method.	**CO-324.02**
	c)	Each phase of a delta-connected load comprises a resistor of 50 Ω and capacitor of 50 µF in series. Calculate the line and phase currents when the load is connected to a 440 V, 3 phase 50 Hz supply.	**CO-324.03**
	d)	Define duality of electric circuits and write duality of electrical elements.	**CO-324.05**
Q.5		**Attempt any TWO 2*6=12**	
	a)	A 100 Ω resistor, 0.02 H inductor and 1.2 µF capacitor are connected in parallel with a circuit made up of resistor of 110 Ω and a capacitor of 2.4 µF. a supply of 230V, 50 Hz is connected across the circuit. Calculate the current taken from the supply & phase angle of it.	**CO-324.02**

	b)	Using source transformation, find the voltage across 12 Ω (v_x), as shown in figure Fig.3 	**CO-324.04**
	c)	Apply Thevenin's theorem to calculate current flowing through R5 = 250 Ω resistor as shown in figure.4  Fig.4	**CO-324.05**
Q.6		**Attempt any TWO 2*6=12**	
	a)	An a.c. series circuit has a resistance of 10 Ω, an inductance of 0.2 H and a capacitance of 60 μF. Calculate: (resonant frequency (current (power at resonance. Applied voltage is 200 V.	**CO-324.01**
	b)	State relationship between line voltage and phase voltage, line current & phase current in a balanced star connection. Draw complete phasor diagram of voltages & current.	**CO-324.03**
	c)	Apply Superposition theorem to calculate current flowing through R4 = 10 Ω resistor as shown in figure.5  Fig.5	**CO-324.05**

CLASS TEST - I PAPER PATTERN

Syllabus:-

Unit No.	Name of the Unit	Course Outcome (CO)
1	Single phase AC series circuit	CO-324.01
2	Single phase AC parallel circuit	CO-324.02

Q.1	Attempt any FOUR 4*2=8Marks	Course Outcome (CO)
	Single phase AC series circuit	CO-324.01
b)	Single phase AC series circuit	CO-324.01
c)	Single phase AC series circuit	CO-324.01
d)	Single phase AC parallel circuit	CO-324.02
e)	Single phase AC parallel circuit	CO-324.02
f)	Single phase AC parallel circuit	CO-324.02
Q.2	Attempt any THREE 3*4=12 Marks	
	Single phase AC series circuit	CO-324.01
b)	Single phase AC series circuit	CO-324.01
c)	Single phase AC series circuit	CO-324.01
d)	Single phase AC parallel circuit	CO-324.02
e)	Single phase AC parallel circuit	CO-324.02

SAMPLE CLASS TEST - I PAPER

Q.1	**Attempt any FOUR 4*2=8Marks**	**Course Outcome (CO)**
	Draw voltage triangles for R-L and R-C single phase AC series circuits.	**CO-324.01**
b)	Define quality factor of series A.C. circuit.	**CO-324.01**
c)	Convert Z = 6 + j8 Ω in polar form.	**CO-324.01**
d)	Define admittance and conductance in relation with parallel circuits. Give formulas for the same.	**CO-324.02**
e)	Write properties of Parallel resonance.	**CO-324.02**
f)	Define Quality Factor for parallel resonance. Give equation of it.	**CO-324.02**
Q.2	**Attempt any THREE 3*4=12 Marks**	
	A resistance 60 Ω and inductance of 0.5 H is connected in series. The combination is supplied with 230 V, 50 Hz A.C. supply. Calculate voltage across each, current through the circuit, power factor and draw complete vector diagram.	**CO-324.01**
b)	A RC series circuit consisting of R = 10 Ω and C = 100 mF is connected across 200V, 50Hz AC supply. Find the value of current and power factor. What will be the value of current and power factor if the value of resistance is doubled?	**CO-324.01**
c)	Derive an expression for resonant frequency of a series RLC circuit.	**CO-324.01**
d)	Impedances Z1 = (10 + j5) Ω and Z2 = (8 + j6) Ω are connected in parallel across V = (200 + j0). Using the admittance method, calculate circuit current and the branch currents.	**CO-324.02**
e)	A coil having resistance of 5 Ω and inductance of 0.2H is arranged in parallel with capacitor of 5d.0 μF. Calculate the current through the combination and power absorbed when a voltages of 100 V, 50 Hz is applied. Use impedance metho	**CO-324.02**

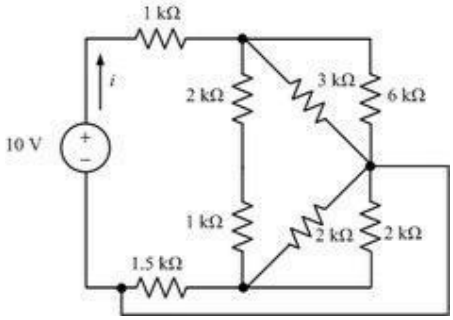
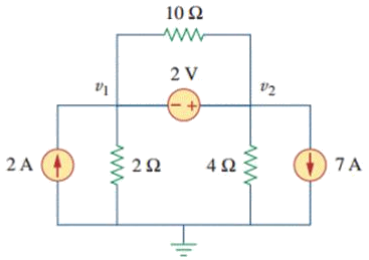
CLASS TEST - II PAPER PATTERN

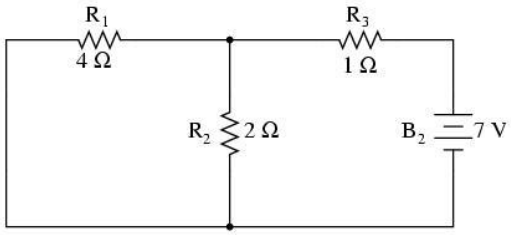
Syllabus:-

Unit No.	Name of the Unit	Course Outcome (CO)
1	Three phase Circuits	CO-324.03
2	Network reduction and principles of DC circuits analysis	CO-324.04
3	Network Theorems	CO-324.05

Q.1	Attempt any FOUR 4*2=8Marks	Course Outcome (CO)
	Three phase Circuits	CO-324.03
b)	Three phase Circuits	CO-324.03
c)	Network reduction and principles of DC circuits analysis	CO-324.04
d)	Network reduction and principles of DC circuits analysis	CO-324.04
e)	Network Theorems	CO-324.05
f)	Network Theorems	CO-324.05
Q.2	Attempt any THREE 3*4=12 Marks	
	Three phase Circuits	CO-324.03
b)	Three phase Circuits	CO-324.03
c)	Network reduction and principles of DC circuits analysis	CO-324.04
d)	Network Theorems	CO-324.05
e)	Network Theorems	CO-324.05

SAMPLE CLASS TEST - II PAPER

Q.1	**Attempt any FOUR 4*2=8Marks**	**Course Outcome (CO)**
a)	Define line voltage and phase voltage	**CO-324.03**
b)	What do you mean by balanced load and balanced supply in relation with polyphase AC circuits?	**CO-324.03**
c)	Give four steps to solve nodal analysis.	**CO-324.04**
d)	How current source can be converted into equivalent voltage source?	**CO-324.04**
e)	State Reciprocity Theorem.	**CO-324.05**
f)	State Norton's theorem.	**CO-324.05**
Q.2	**Attempt any THREE 3*4=12 Marks**	
	Three coils each with a resistance of 10 Ω and inductance of 0.35mH are connected in star to a 3-phase, 440 V, 50 Hz supply. Calculate the line current and total power taken per phase.	**CO-324.03**
b)	Derive relation between line and phase voltages of star connection of 3ph load.	**CO-324.03**
c)	Find current in 1k Ω by using star delta transformation. 	**CO-324.04**
d)	Find the current in 10 Ω by using superposition theorem. 	**CO-324.05**

e)	Find maximum power in R1= 4 Ω by using maximum power transfer theorem 	**CO-324.05**

COURSE OUTCOME (CO)

COURSE: - ELECTRICAL CIRCUITS (22324)

PROGRAMME: - ELECTRICAL ENGINEERING.

CO.NO	Course Outcome
CO-324.01	Troubleshoot problems related to single phase A.C. series circuits.
CO-324.02	Troubleshoot problems related to single phase A.C. parallel circuits.
CO-324.03	Troubleshoot problems related to three phase circuits
CO-324.04	Use principles of circuit analysis to troubleshoot problems related to electric circuits
CO-324.05	Apply network theorems to troubleshoot problems related to electric circuits

SINGLE PHASE AC SERIES CIRCUITS

Position in Question Paper **Total Marks-22**

Q.1. a) 2-Marks.
b) 2-Marks.
Q.2. a) 4-Marks.
Q.3. a) 4-Marks.
Q.4. a) 4-Marks.
Q.6. a) 6-Marks.

Descriptive Question

1. Define - frequency. State its relation with time period.
2. . If maximum value of a sine wave is 25A. Calculate its average value.
3. . Draw a power triangle and state the relation between its sides.
4. State the range of phase angle and hence pf for a series RC circuit.
5. In a series RL circuit V_R = 100V and V_L = 150V. Find equivalent voltage across the circuit.
6. An alternating current is given by i = 20 sin (314t). Find –Current at t = 0.0025 sec at first instant. Time required to reach at 12A for first time.
7. A series circuit has a leading pf. Express it with circuit, waveform and phasor diagram.
8. In RLC series circuit R = 8W, L = 0.42 H with an unknown capacitor. If the circuit is connected across 230V, 50 Hz, 1φ AC. Calculate value of capacitor so that circuit resonates at supply frequency. Also calculate current and pf at this instant.
9. Define peak factor and form factor. State value of each for a pure sine wave.
10. A series RLC circuit consists of R = 20W, L = 1H and C = 2500 µf. If it is connected across 230V, 1φ AC. Calculate Q factor and resonant frequency.
11. Derive the condition for resonance in an RLC series circuit. Also derive the equation for Q factor.
12. State nature of pf for any two conditions in RLC series circuit. Draw phasor diagram for each.

MCQ Question

(Total number of Question=Marks*3=22*3=66)

Note: Correct answer is marked with **bold.**

1. Instantaneous voltage is the product of resistance and _____ current in a resistive circuit.
   - **a) Instantaneous**
   - c) RMS
   - **b)** Average
   - 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
   - **c) 10V**
   - b) 2V
   - d) 2.5V

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

4. The correct expression for the instantaneous current if instantaneous voltage is Vm(sint) in a resistive circuit is?
   - a) 1A
   - c) 3A
   - **b) 2A**
   - d) 4A

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

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

7. Can ohm's law be applied in an ac circuit?
   - **a) Yes**
   - c) Depends on the rms current
   - b) No
   - d) Depends on the rms voltage

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

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

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

11. Choke involve use of _____
   - a) Resistor
   - b) Capacitor

c) **Inductor** d) Transistor

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

13. What is the current in an inductive circuit when the applied voltage is maximum?
a) Infinity **c) Zero**
b) Maximum d) Cannot be determined

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

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

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

17. 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 c) 6.2A
b) 4.2A d) **8.2A**

18. 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 phase difference.
a) -55.1 c) 6
b) 55.1 d) -66.1

19. 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 c) 67.3V
b) **57.4V** d) 78.2V

20. 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 c) 65V
b) 82V d) 76V

21. 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 **c) 100V**
b) 50V d) 120

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

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

24. What is φ in terms of voltage?
a) $\varphi=\cos^{-1}V/VR$
b) $\varphi=\cos^{-1}V*VR$
c) $\varphi=\cos^{-1}VR/V$
d) $\varphi=\tan^{-1}V/VR$

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

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

27. What is impedance at resonance?
a) maximum
b) minimum
c) zero
d) cannot be determined

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

29. What is φ in terms of voltage?
a) $\varphi=\cos^{-1}V/V_R$
b) $\varphi=\cos^{-1}V*V_R$
c) $\varphi=\cos^{-1}V_R/V$
d) $\varphi=\tan^{-1}V/V_R$

30. What is tanϕ for RC circuit?
a) X_C/R
b) X_L/R
c) R/Z
d) Z/R

31. 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

32. What is the frequency in resonance condition?
a) Minimum
b) Maximum
c) Cannot be determined
d) Zero

33. Can capacitor fully charge using alternating current?
a) Yes
b) No
c) may or may not
d) depend on value of capacitance

34. What is the resistance offered by a capacitor?
a) Susceptance
b) Conductance
c) Admittance
d) Reactance

35. The combination of resistance and reactance known as _____
a) Susceptance
b) Impedance

c) Conductance
d) Admittance

36. What is the relation between reactance, resistance and impedance?

a) Z=R+Jx
c) Z=R-X
b) Z=R+X
d) Z=R-jX

37. What is the real part of the impedance of RLC circuit?

a) Resistance
c) Admittance
b) Conductance
d) Reactance

38. What is imaginary part of the impedance of RLC circuit?

a) Resistance
c) Admittance
b) Conductance
d) Reactance

39. Which type of current can be stored in a capacitor?

a) Alternating current
b) Both alternating current and direct current
c) Direct current
d) Neither alternating current nor direct current

40.If in an alternating current circuit, resistance is 5 ohm, capacitive reactance is 12 ohm, what is the impedance?

a) 5 ohm
c) 12 ohm
b) 10 ohm
d) 13 ohm

41. If in an alternating current circuit, impedance is 26 ohm, capacitive reactance is 24 ohm, what is the resistance?

a) 25 ohm
c) 12 ohm
b) **10 ohm**
d) 23 ohm

42. If in an alternating current circuit, capacitance of 30 µF is connected to a supply of 200V,50Hz. Find the current in the circuit.

a) 1.38 A
c) 1.74 A
b) 1.89 A
d) 0.89 A

43. If in an alternating current circuit, capacitance C is connected to a supply of 200V,50Hz. Current in the circuit is 1.89 A. Find the capacitance C.

a) **30 µF**
c) 10 µF
b) 20 µF
d) 15 µF

44. In ac circuit, resistance 5 ohm is connected with capacitor having capacitive reactance 12 ohm. Supply of 260 V is connected to the circuit. Calculate the current in the circuit.

a) 40 A
c) 20 A
b) 10 A
d) 30 A

45. In ac circuit, resistance 5 ohm is connected with capacitor having capacitive reactance 12 ohm. Supply of 260 V is connected to the circuit. Calculate the voltage across resistance.

a) 300 V
b) 200 V

c) 240 V
d) **100 V**

46. In ac circuit, resistance 5 ohm is connected with a capacitor having capacitive reactance 12 ohm. Supply of 260 V is connected to the circuit. Calculate the voltage across a capacitor.
a) 300 V
c) 240 V
b) 200 V
d) 100 V

47. Find the total voltage applied in a series RLC circuit when i=3mA, V_L=30V, V_C=18V and R=1000 ohms.
a) 3.95V
c) 32.67V
b) 51V
d) 6.67V

48. In an RLC circuit, which of the following is always used as a vector reference?
a) Voltage
c) Impedance
b) Resistance
d) Current

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

50. What is the correct expression for the phase angle in an RLC series circuit?
a) $\varphi=\tan^{-1}(X_L-X_C)/R$
c) $\varphi=\tan(X_L-X_C)/R$
b) $\varphi=\tan^{-1}(X_L+X_C)/R$
d) $\varphi=\tan^{-1}(X_L-X)$

51. When is tanφ positive?)
a) When inductive reactance is less than capacitive reactance
b) **When inductive reactance is greater than capacitive reactance**
c) When inductive reactance is equal to capacitive reactance
d) When inductive reactance is zero

52. When is tanφ negative?
a) **When inductive reactance is less than capacitive reactance**
b) When inductive reactance is greater than capacitive reactance
c) When inductive reactance is equal to capacitive reactance
d) When inductive reactance is zero

53. Which of the following is not ac waveform?
a) Sinusoidal
c) Square
b) **Constant**
d) triangular

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

55. Which type of ac waveform is given in figure?
a) **Sinusoidal**
c) Square
b) Triangular
d) complex waveform

56. 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) **$i = -Vm(cost)/X_L$**

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

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

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

60. 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

61. What is the current in an inductive circuit when the applied voltage is maximum?
   a) Infinity
   b) Maximum
   c) Zero
   d) Cannot be determined

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

63. In an RLC circuit, the power factor is always _____
   a) Positive
   e) Negative
   f) Depends on the circuit
   g) Zero

64. What is the correct expression for the phase angle in an RLC series circuit?
   a) $\varphi=\tan^{-1}(X_L+X_C)/R$
   b) $\varphi=\tan(X_L-X_C)/R$
   c) $\varphi=\tan^{-1}(X_L-X)$
   d) $\varphi=\tan^{-1}(X_L-X_C)/R$

65. When is tanφ positive?
   a) **When inductive reactance is greater than capacitive reactance**
   b) When inductive reactance is equal to capacitive reactance
   c) When inductive reactance is zero
   d) When inductive reactance is less than capacitive reactance

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

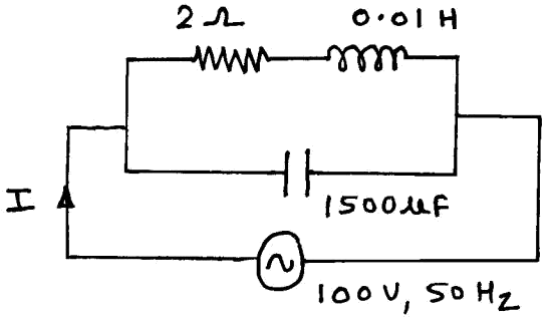
SINGLE PHASE AC PARALLEL CIRCUITS

Position in Question Paper **Total Marks-20**

Q.1. c) 2-Marks.
Q.2. b) 4-Marks.
Q.3. b) 4-Marks.
Q.4. b) 4-Marks.
Q.5. a) 6-Marks.

Descriptive Question

1. Two admittances $Y_1 = 0.012 < 60°$ and $Y_2 = 0.015 < 45°$ are connected in parallel across 250V, 50Hz AC. Calculate power consumed by the circuit.
2. Draw an experimental set up to find current and power for parallel circuit of R = 50W and L = 0.2H, V = 230V, 50Hz, 1φ AC.
3. Write equation of resonant frequency and quality factor in terms of circuit components for a parallel circuit.
4. Find current I in the circuit shown in Figure No. 1 using admittance method.
5. **Fig. No. 1**



6. Two impedances (5 + *j*6) W and (7 – *j*8) W are connected in parallel across 230 V, 1f, 50 Hz a.c. supply. Determine current drawn by each path and total current in the circuit.
7. A voltage of 200 ∠ 0° is applied across two impedances in parallel. The values of impedance are (12 + j16) and (10 – j20). Determine the kVA, kVAR and kW in each branch and power factor of the whole circuit.
8. If A = 10 + j8, B = – 7 + j5, C = 8 + j6 Find: I. AB/C II. (A+B)/ (B–C)

MCQ Question

(Total number of Question=Marks*3=20*3=60)

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 _____
   a) Resistance
   b) Capacitance
   c) Inductance
   d) Impedance

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

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

5. What is the unit of admittance?
   a) Ohm
   b) Henry
   c) Farad
   d) ohm^{-1}

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

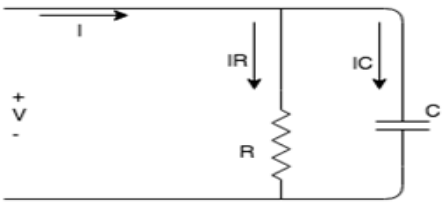
7. if the impedance of a system is 4 ohm, calculate its admittance.
   a) 0.25 ohm^{-1}
   b) 4 ohm^{-1}
   c) 25 ohm^{-1}
   d) 0.4 ohm^{-1}

8. 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

9. In A parallel circuit, with any number of impedances, the voltage across each impedance is?
   a) Equal
   b) divided equally
   c) divided proportionally
   d) zero

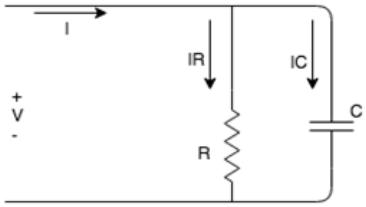
10. In a parallel circuit, current in each impedance is_____
   a) Equal
   b) Different
   c) Zero
   d) infinite

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



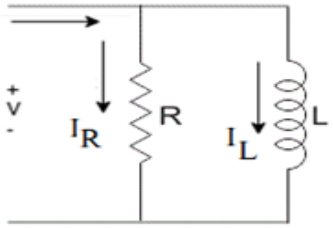
   a) 0
   b) V/I
   c) V/R
   d) Cannot be determined

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



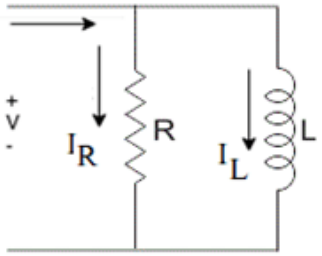
a) I_R leads V
b) I_R lags V
c) I_R and V are in phase
d) No relation

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



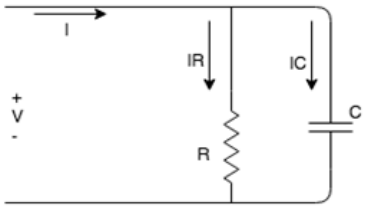
a) V/I
b) V/X_L
c) 0
d) Cannot be determined

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



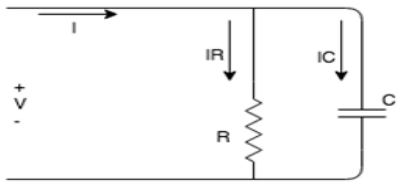
a) **I_L lags V**
b) I_L leads V
c) I_L and V are in phase
d) No relation

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



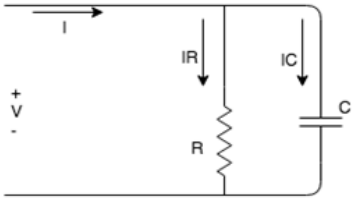
a) $I=I_C$
b) $I=I_R$
c) **$I=I_C+I_R$**
d) I=0

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



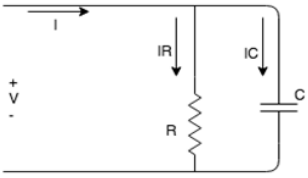
a) 3A
b) -3A
c) 7A
d) 10A

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



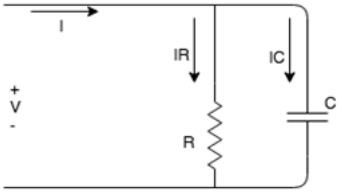
a) 5A
c) 12A
b) 18A
d) 2A

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



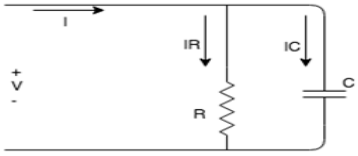
a) 4A
c) 12A
b) 18A
d) 2A

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



a) V/C
c) 0
b) V/I
d) $\mathbf{V/X_C}$

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



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

21. In an impedance parallel network, the reactive component wills _____ the voltage by 90 degrees.

a) Lead
c) Either lead or lag
b) Lag
d) Depends on the circuit

22. In an impedance parallel network, the reactive component will either lead or lag the voltage by _____ degrees.

a) 0
c) 45
b) 90
d) 180

23. In an impedance parallel network, the reactive component will either lead or lag the _____ by 90 degrees.

a) Voltage
c) Either voltage or current
b) Current
d) Cannot be determined

24. The reactive component in an impedance parallel circuit leads the voltage when the current _____ the voltage.

a) Leads
c) Either leads or lags
b) Lags
d) Cannot be determined

25. The active component in an impedance parallel circuit wills _____ the voltage.

a) Leads
c) Be in phase with
b) Lags
d) Either leads or lags

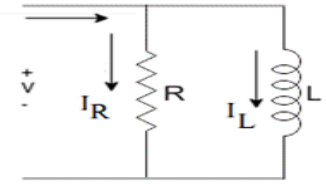
26. The phase difference between the active component of an impedance parallel circuit and the voltage in the network is _____

a) 0
c) 180
b) 90
d) 360

27. The quadrature component is also known as?

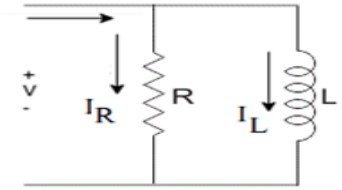
a) Active component
d) Neither active nor reactive component
b) Reactive component
c) Either active or reactive component

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



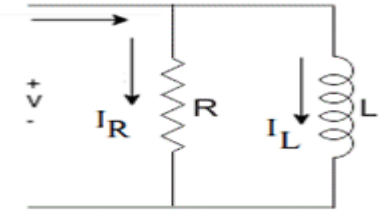
a) $I=I_L$
c) $I=I_L+I_R$
b) $I=I_R$
d) I=0

29. Find the value of I_R if I=10A and I_L=8A.



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

30. Find the total current if I_L=2A and I_R=8A.



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

31. In a series RLC circuit, the phase difference between the current in the capacitor and the current in the resistor is?

a) 0^0
c) 180^0
b) 90^0
d) 360^0

32. In a series RLC circuit, the phase difference between the current in the inductor and the current in the resistor is?
a) 0^0
c) 180^0
b) 90^0
d) 360^0

33. In a series RLC circuit, the phase difference between the current in the capacitor and the current in the inductor is?
a) 0^0
c) 180^0
b) 90^0
d) 360^0

34. In a series RLC circuit, the phase difference between the current in the circuit and the voltage across the resistor is?
a) 0^0
c) 180^0
b) 90^0
d) 360^0

35. In a series RLC circuit, the phase difference between the current in the circuit and the voltage across the capacitor is?
a) 0^0
c) 180^0
b) 90^0
d) 360^0

36. _____ the resonant frequency, the current in the inductor lags the voltage in a series RLC circuit.
a) Above
c) Equal to
b) Below
d) Depends on the circuit

37. _____ the resonant frequency, the current in the capacitor leads the voltage in a series RLC circuit.
a) Above
c) Equal to
b) Below
d) Depends on the circuit

38. What is imaginary part of the impedance of RLC circuit?
a) Resistance
c) Admittance
b) Conductance
d) Reactance

39. Which type of current can be stored in a capacitor?
a) Alternating current
b) Both alternating current and direct current
c) Direct current
d) Neither alternating current nor direct current

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

41. If in an alternating current circuit, impedance is 26 ohm, capacitive reactance is 24 ohm, what is the resistance?
a) 25 ohm
c) 12 ohm
b) **10 ohm**
d) 23 ohm

42. If in an alternating current circuit, capacitance of 30 µF is connected to a supply of 200V, 50Hz. Find the current in the circuit.

a) 1.38 A
c) 1.74 A
b) 1.89 A
d) 0.89 A

43. If in an alternating current circuit, capacitance C is connected to a supply of 200V,50Hz. Current in the circuit is 1.89 A. Find the capacitance C.

a) **30 µF**
c) 10 µF
b) 20 µF
d) 15 µF

44. In ac circuit, resistance 5 ohm is connected with capacitor having capacitive reactance 12 ohm. Supply of 260 V is connected to the circuit. Calculate the current in the circuit.

a) 40 A
c) 20 A
b) 10 A
d) 30 A

45. In ac circuit, resistance 5 ohm is connected with capacitor having capacitive reactance 12 ohm. Supply of 260 V is connected to the circuit. Calculate the voltage across resistance.

a) 300 V
c) 240 V
b) 200 V
d) **100 V**

46. In ac circuit, resistance 5 ohm is connected with a capacitor having capacitive reactance 12 ohm. Supply of 260 V is connected to the circuit. Calculate the voltage across a capacitor.

a) 300 V
c) 240 V
b) 200 V
d) 100 V

47. Find the total voltage applied in a series RLC circuit when i=3mA, V_L=30V, V_C=18V and R=1000 ohms.

a) 3.95V
c) 32.67V
b) 51V
d) 6.67V

48. In an RLC circuit, which of the following is always used as a vector reference?

a) Voltage
c) Impedance
b) Resistance
d) Current

49. In an RLC circuit, the power factor is always _____

a) Positive
c) Depends on the circuit
b) Negative
d) Zero

50. What is the correct expression for the phase angle in an RLC series circuit?

a) $\varphi=\tan^{-1}(X_L-X_C)/R$
c) $\varphi=\tan(X_L-X_C)/R$
b) $\varphi=\tan^{-1}(X_L+X_C)/R$
d) $\varphi=\tan^{-1}(X_L-X)$

51. When is tanφ positive?)

a) When inductive reactance is less than capacitive reactance
b) **When inductive reactance is greater than capacitive reactance**
c) When inductive reactance is equal to capacitive reactance

d) When inductive reactance is zero

52. When is tanφ negative?
   a) **When inductive reactance is less than capacitive reactance**
   b) When inductive reactance is greater than capacitive reactance
   c) When inductive reactance is equal to capacitive reactance
   d) When inductive reactance is zero

53. Which of the following is not ac waveform?
   a) Sinusoidal
   b) **Constant**
   c) Square
   d) triangular

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

55. Which type of ac waveform is given in figure?
   a) **Sinusoidal**
   b) Triangular
   c) Square
   d) complex waveform

56. 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) **$i = -Vm(cost)/X_L$**

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

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

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

60. 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

THREE PHASE CIRCUITS

Position in Question Paper **Total Marks-20**

Q.1. d) 2-Marks.
Q.2. c) 4-Marks.
Q.3. c) 4-Marks.
Q.4. c) 4-Marks.
Q.6. b) 6-Marks.

Descriptive Question

1. Draw phasor diagram for 3φ generated voltages.
2. List any two advantages of 3φ circuits over single phase circuits.
3. List any four observations from the phasor diagram of a 3φ delta connection.
4. Three impedances each of Z = 15 + j18W are connected in star across a 400V,3φ, AC. Calculate –$V_{ph,}$ $I_{ph,}$ $I_{L,}$ Pf
5. Draw the sinusoidal waveform of 3ph emf and also indicate the phase sequence.
6. State relationship between line voltage and phase voltage, line current and phase current in a balanced delta connection. Draw complete phasor diagram of voltages and current.
7. State any four advantages of poly phase circuit over single phase circuit.

MCQ Question

(Total number of Question=Marks*3=24*3=72)

Note: Correct answer is marked with **bold.**

1. In a balanced three-phase system-delta load, if we assume the line voltage is $V_{RY} = V\angle 0^0$ as a reference phasor. Then the source voltage V_{YB} is?
   a) $V\angle 0^0$
   c) $V\angle 120^0$
   b) $V\angle -120^0$
   d) $V\angle 240^0$
2. In a balanced three-phase system-delta load, if we assume the line voltage is $V_{RY} = V\angle 0^0$ as a reference phasor. Then the source voltage V_{BR} is?
   a) $V\angle 120^0$
   c) $V\angle -240^0$
   b) $V\angle 240^0$
   d) $V\angle -120^0$
3. In a delta-connected load, the relation between line voltage and the phase voltage is?
   a) line voltage > phase voltage
   c) line voltage = phase voltage
   b) line voltage < phase voltage
   d) line voltage >= phase voltage
4. If the load impedance is $Z\angle Ø$, the current (I_R) is?
   a) $(V/Z)\angle -Ø$
   c) $(V/Z)\angle 90-Ø$
   b) $(V/Z)\angle Ø$
   d) $(V/Z)\angle -90+Ø$
5. If the load impedance is $Z\angle Ø$, the expression obtained for current (I_Y) is?
   a) $(V/Z)\angle -120+Ø$
   c) $(V/Z)\angle 120+Ø$
   b) $(V/Z)\angle 120-Ø$
   d) $(V/Z)\angle -120-Ø$
6. If the load impedance is $Z\angle Ø$, the expression obtained for current (Iis?
   a) $(V/Z)\angle -240+Ø$
   c) $(V/Z)\angle 240-Ø$
   b) $(V/Z)\angle -240-Ø$
   d) $(V/Z)\angle 240+Ø$
7. A three-phase balanced delta connected load of (4+j8) Ω is connected across a 400V, 3 – Ø balanced supply. Determine the phase current I_R. Assume the phase sequence to be R_{YB}.
   a) $44.74\angle -63.4^0$A
   c) $45.74\angle -63.4^0$A
   b) $44.74\angle 63.4^0$A
   d) $45.74\angle 63.4^0$A
8. A three-phase balanced delta connected load of (4+j8) Ω is connected across a 400V, 3 – Ø balanced supply. Determine the phase current I_Y.
   a) $44.74\angle 183.4^0$A
   c) $44.74\angle 183.4^0$A
   b) $45.74\angle 183.4^0$A
   d) $45.74\angle -183.4^0$A
9. A three-phase balanced delta connected load of (4+j8) Ω is connected across a 400V, 3 – Ø balanced supply. Determine the phase current I_B.
   a) $44.74\angle 303.4^0$A
   c) $45.74\angle 303.4^0$A
   b) $44.74\angle -303.4^0$A
   d) $45.74\angle -303.4^0$A
10. Determine the power (kW) drawn by the load.
    a) 21
    c) 23
    b) 22
    d) 24
11. 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

12. The percentage of power increased from single phase to three phase is?

a) 50 c) 150

b) 100 d) 200

13. When the power factor is _____ the power becomes zero 100 times a second in a 50Hz supply.

a) 0 c) 2

b) 1 d) 3

14. Which motors are called self-starting motors?

a) single phase **c) three phase**

b) two phase d) four phase

15. In three phase system, the three voltages (currents) differ in phase by _____electrical degrees from each other in a particular sequence.

a) 30 c) 90

b) 60 **d) 12**

16. In a two phase generator, the armature has two distinct windings that are displaced _____ apart.

a) 45^0 c) 135^0

b) 90^0 d) 180^0

17. In three phase system at any given instant, the algebraic sum of three voltages must be?

a) 0 c) 2

b) 1 d) 3

18. Phase sequence depends on the _____

a) Field c) armature

b) rotation of the field d) rotation of the armature

19. 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) $V_m \sin\omega t$ d) $V_m \sin(\omega t - 240^0)$

b) $V_m \sin(\omega t + 120^0)$

c) **$V_m \sin(\omega t - 120^0)$**

20. 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 the value of V'_{BB} is?

a) $V_m \sin(\omega t - 240^0)$ c) $V_m \sin(\omega t + 240^0)$

b) $V_m \sin(\omega t - 120^0)$ d) $V_m \sin\omega t$

21. In a three phase alternator, there are _____ independent phase windings or coils.

a) 1 **c) 3**

b) 2 d) 4

22. Each coil in three phase alternator has _____ number of terminals.

a) 2 c) 6

b) 4 d) 8

23. 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

24. 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 poin

25. 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

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

27. 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) $\mathbf{V_{phase} = V_{line}}$
d) $V_{phase} >= V_{line}$

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

29. A balanced delta-connected load of (2+j3) Ω per phase is connected to a balanced three-phase 440V supply. The phase current is 10A. Find the total active power.
a) 7.26W
b) 726W
c) 7260W
d) 72.6W

30. A balanced delta-connected load of (2+j3) Ω per phase is connected to a balanced three-phase 440V supply. The phase current is 10A. Find the apparent power.
a) 10955.67 VAR
b) 10.95567 VAR
c) 109.5567 VAR
d) 1.095567 VAR

31. In star connected system, V_{RY} is equal to?
a) V_{YR}
b) $\mathbf{-V_{YR}}$
c) $2V_{YR}$
d) $3V_{YR}$

32. In three phase system, the line voltage V_{RY} is equal to?
a) phasor sum of $\mathbf{V_{RN}}$ and $\mathbf{V_{NY}}$
b) phasor difference of V_{RN} and V_{NY}
c) phasor sum of V_{RN} and V_{NY}
d) algebraic sum of V_{RN} and V_{NY}

33. The relation between the lengths of the phasors V_{RN} and $-V_{YN}$ is?
a) $|V_{RN}| > -|V_{YN}|$
b) $|V_{RN}| < -|V_{YN}|$
c) $\mathbf{|V_{RN}| = -|V_{YN}|}$
d) $|V_{RN}| >= -|V_{YN}|$

34. In a star connected system, the phasors V_{RN}, V_{YN} are ____ apart.
a) 15^0
b) 30^0
c) 45^0
d) $\mathbf{60^0}$

35. The relation between V_{RY}, Vph in a star connected system is?
a) $V_{RY} = V_{ph}$
b) $\mathbf{V_{RY} = \sqrt{3}V_{ph}}$
c) $V_{RY} = 3\sqrt{3}V_{ph}$
d) $V_{RY} = 3V_{ph}$

36. In a star connected system, the relation between V_{YB}, V_{ph} is?
a) $V_{YB} = V_{ph}$
c) $V_{YB} = 3V_{ph}$
b) $V_{YB} = 3\sqrt{3}V_{ph}$
d) $V_{YB} = \sqrt{3}V_{ph}$

37. The voltages, V_{BR} ,V_{ph} are related in star connected system is?
a) $V_{BR} = 3V_{ph}$
c) $V_{BR} = \sqrt{3}V_{ph}$
b) $V_{BR} = 3\sqrt{3}V_{ph}$
d) $V_{BR} = V_{ph}$

38. In a delta connected system, the voltage across the terminals R and Y is $400\angle 0^0$. Calculate the line voltage V_{RY}. Assume R_{RY} phase sequence.
a) $400\angle 0^0$
c) $400\angle -120^0$
b) $400\angle 120^0$
d) $400\angle 240^0$

39. In a delta connected system, the voltage across the terminals R and Y is $400\angle 0^0$. Find the line voltage V_{YB}.
a) $400\angle 120^0$
c) $400\angle 240^0$
b) $400\angle -120^0$
d) $400\angle -240^0$

40. In a delta connected system, the voltage across the terminals R and Y is $400\angle 0^0$. Find the line voltage V_{BR}.
a) $400\angle 240^0$
c) $400\angle -240^0$
b) $400\angle 120^0$
d) $400\angle -120^0$

41. In delta-connected system, the currents I_R, I_Y, I_B are equal in magnitude and they are displaced by _____ from one another.
a) 0^0
c) 90^0
b) 60^0
d) **120^0**

42. In a delta-connected system, the currents $I_R = I_B = I_Y$ =?
a) I_{Ph}
c) $3I_{Ph}$
b) $2I_{Ph}$
d) $4I_{Ph}$

43. The relation between I_L and I_{Ph} is in a delta connected system is?
a) $I_L = I_{Ph}$
c) $I_L = 3\ I_{Ph}$
b) $I_L = \sqrt{3}\ I_{Ph}$
d) $I_L = 3\sqrt{3}I_{Ph}$

44. The line currents are _____ behind respective phase currents in a delta connected system.
a) 120^0
c) 60^0
b) 90^0
d) 30^0

45. In a delta connected system, the expression of power (P) is?
a) $V_L I_L \cos\varphi$ W
c) $3V_L I_L \cos\varphi$ W
b) $\sqrt{3}\ V_L I_L \cos\varphi$ W
d) $3\sqrt{3}V_L I_L \cos\varphi$ W

46. In a balanced three-phase system-delta load, if we assume the line voltage is $V_{RY} = V\angle 0^0$ as a reference phasor. Then the source voltage V_{YB} is?
a) $V\angle 0^0$
c) $V\angle 120^0$
b) $V\angle -120^0$
d) $V\angle 240^0$

47. In a balanced three-phase system-delta load, if we assume the line voltage is $V_{RY} = V\angle 0^0$ as a reference phasor. Then the source voltage V_{BR} is?
a) $V\angle 120^0$
b) $V\angle 240^0$

c) V∠-240^0
d) V∠-120^0

48. In a delta-connected load, the relation between line voltage and the phase voltage is?
a) line voltage > phase voltage
c) line voltage = phase voltage
b) line voltage < phase voltage
d) line voltage >= phase voltage

49. If the load impedance is Z∠Ø, the current (I_R) is?
a) (V/Z)∠-Ø
c) (V/Z)∠90-Ø
b) (V/Z)∠Ø
d) (V/Z)∠-90+Ø

50. If the load impedance is Z∠Ø, the expression obtained for current (I_Y) is?
a) (V/Z)∠-120+Ø
c) (V/Z)∠120+Ø
b) (V/Z)∠120-Ø
d) **(V/Z)∠-120-Ø**

51. If the load impedance is Z∠Ø, the expression obtained for current (Iis?
a) (V/Z)∠-240+Ø
c) (V/Z)∠240-Ø
b) (V/Z)∠-240-Ø
d) (V/Z)∠240+Ø

52. A three-phase balanced delta connected load of (4+j8) Ω is connected across a 400V, 3 – Ø balanced supply. Determine the phase current I_R. Assume the phase sequence to be R_{YB}.
a) 44.74∠-63.4^{0}A
c) 45.74∠-63.4^{0}A
b) 44.74∠63.4^{0}A
d) 45.74∠63.4^{0}A

53. A three-phase balanced delta connected load of (4+j8) Ω is connected across a 400V, 3 – Ø balanced supply. Determine the phase current I_Y.
a) 44.74∠183.4^{0}A
c) 44.74∠183.4^{0}A
b) 45.74∠183.4^{0}A
d) 45.74∠-183.4^{0}A

54. A three-phase balanced delta connected load of (4+j8) Ω is connected across a 400V, 3 – Ø balanced supply. Determine the phase current I_B.
a) 44.74∠303.4^{0}A
c) 45.74∠303.4^{0}A
b) 44.74∠-303.4^{0}A
d) 45.74∠-303.4^{0}A

55. Determine the power (kW) drawn by the load.
a) 21
c) 23
b) 22
d) 24

56. The wattmeter method is used to measure power in a three-phase load. The wattmeter readings are 400W and -35W. Calculate the total active power.
a) 360
c) 370
b) 365
d) 375

57. The wattmeter method is used to measure power in a three-phase load. The wattmeter readings are 400W and -35W. Find the power factor.
a) 0.43
c) 0.63
b) 0.53
d) 0.73

58. The wattmeter method is used to measure power in a three-phase load. The wattmeter readings are 400W and -35W. Find the reactive power.
a) 751.44
c) 753.44
b) 752.44
d) 754.44

59. The input power to a three-phase load is 10kW at 0.8 Pf. Two watt meters are connected to measure the power. Find the reading of higher reading wattmeter.

a) 7.165
c) 6.165
b) 6.165
d) 4.165

60. The input power to a three-phase load is 10kW at 0.8 Pf. Two watt meters are connected to measure the power. Find the reading of lower reading wattmeter.

a) 1.835
c) 3.835
b) 2.835
d) 4.835

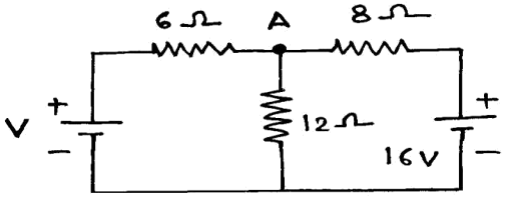
NETWORK ERDUCTION AND PRINCIPLES OF CIRCUIT ANALYSIS

Position in Question Paper **Total Marks-16**

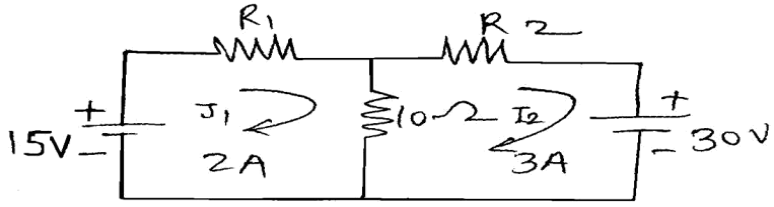
Q.1. e) 2-Marks.
Q.2. d) 4-Marks.
Q.3. d) 4-Marks.
Q.5. b) 6-Marks.

Descriptive Question

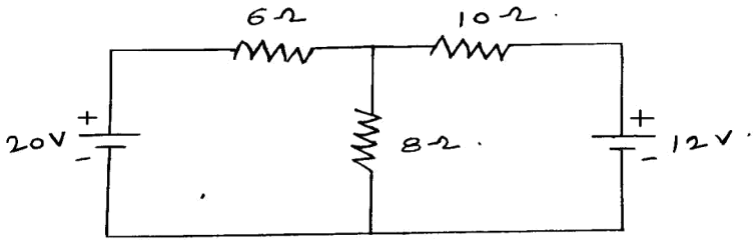
1. Three resistor each of 23W are connected in delta across a 230V, 3φ, 50Hz AC. Calculate the power consumed by the load.
2. State only the formula for star to delta transformation.
3. Find the value of V of Figure if the voltage at node A is 12V.



4. Derive the formulae for star to delta, and star to delta transformation.
5. Using mesh analysis finds value of R1 and R2 shown in Figure



6. Find current through 8 W resistance using nodal analysis in Figure



MCQ Question

(Total number of Question=Marks*3=16*3=48)

Note: Correct answer is marked with **bold.**

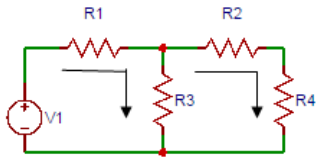
1. Mesh analysis is applicable for non planar networks also.

a) True **b) false**

2. A mesh is a loop which contains ____ number of loops within it.

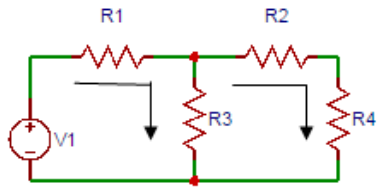
a) 1 c) 3
b) 2 d) **no loop**

3. Consider the circuit shown below. The number mesh equations that can be formed are?



a) 1 c) 3
b) 2 d) 4

4. In the figure shown below, the current through loop 1 be I_1 and through the loop 2 be I_2, then the current flowing through the resistor R_2 will be?

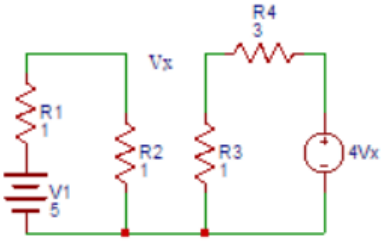


a) I_1 **c) I_1-I_2**
b) I_2 d) I_1+I_2

5. If there are 5 branches and 4 nodes in graph, then the number of mesh equations that can be formed are?

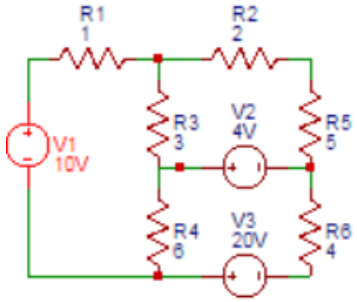
a) 2 c) 6
b) 4 d) 8

6. Consider the circuit shown in the figure. Find voltage V_x.



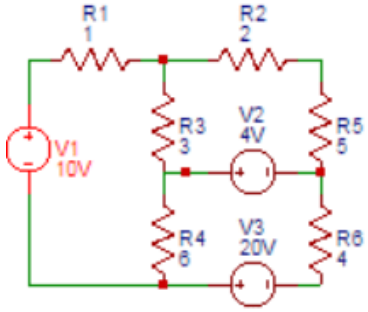
a) 1 c) 1.5
b) 1.25 d) 1.75

7. Consider the circuit shown below. Find the current I_1.



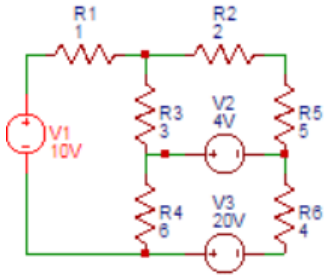
a) 3.3
b) 4.3
c) 5.3
d) 6.3

8. Consider the following figure. Find the current I_2 (.



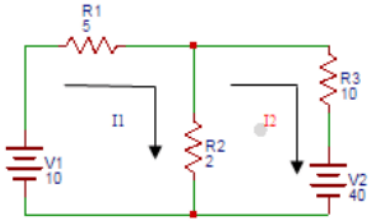
a) 1.7
b) 2.6
c) 3.6
d) 4.6

9. Consider the following figure. Find the current I_3 (.



a) 4
b) 4.7
c) 5
d) 5.7

10. Find current through R_2 resistor.



a) 3
b) 3.25
c) 3.5
d) 3.75

11. If there are 8 nodes in network, we can get ____ number of equations in the nodal analysis.

a) 9
b) 8
c) 7
d) 6

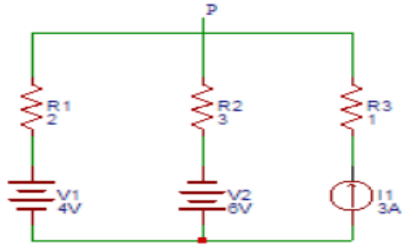
12. Nodal analysis can be applied for non planar networks also.

a) True
b) False

13. In nodal analysis how many nodes are taken as reference nodes?

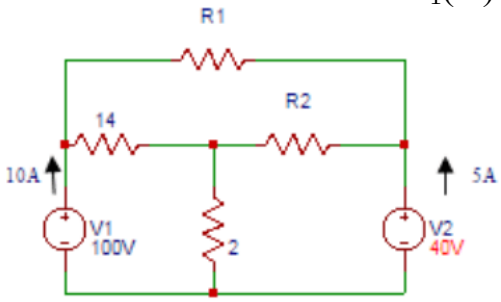
a) 1
b) 2
c) 3
d) 4

14. Find the voltage at node P in the following figure.



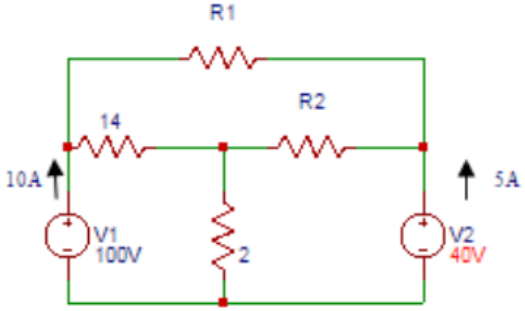
a) 8V
b) 9V
c) 10V
d) 11V

15. Find the resistor value $R_1(\Omega)$ in the figure shown below.



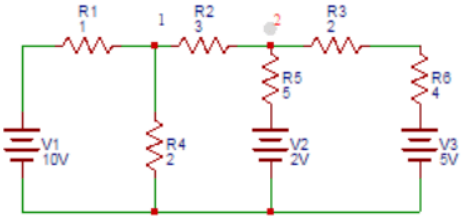
a) 10
b) 11
c) 12
d) 13

16. Find the value of the resistor R_2 (Ω) in the circuit shown below.



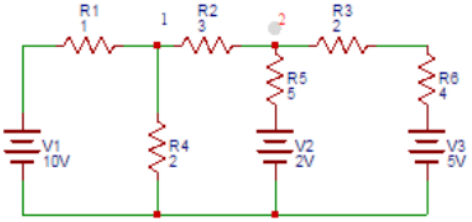
a) 5
b) 6
c) 7
d) 8

17. Find the voltage (V) at node 1 in the circuit shown.



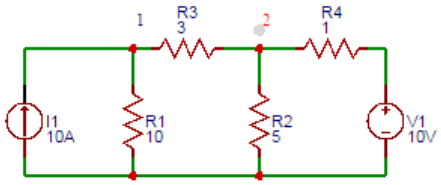
a) 5.32
c) 7.32
b) 6.32
d) 8.32

18. Find the voltage (V) at node 2 in the circuit shown below.



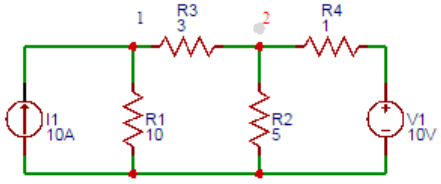
a) 2.7
c) 4.7
b) 3.7
d) 5.7

19. Find the voltage at node 1 of the circuit shown below.



a) 32.7
c) 34.7
b) 33.7
d) 35.7

20. Find the voltage at node 2 of the circuit shown below.



a) 13
c) 15
b) 14
d) 16

21. By using source transformation voltage source in series resistor is replaced by

a) Voltage source in series with a resistor
b) Current source in parallel with a resistor
c) Voltage source in parallel with a resistor
d) Current source in series with a resistor

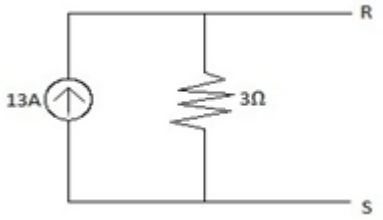
22. Source Transformation is _____

a) Unilateral
c) Bilateral
b) Unique
d) Complicated

23. If there are two resistors in parallel and in series with a voltage source then _____

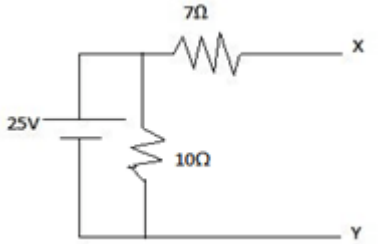
a) Parallel resistor has no effect
b) Series resistor has no effect
c) Both has their respective effects
d) Both has no effect on the voltage source

24. Using source transformation, calculate the voltage.



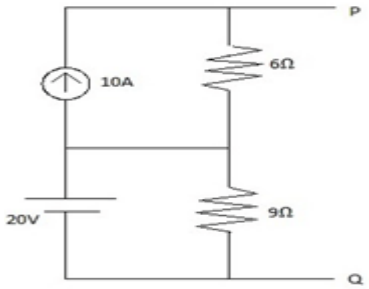
a) 4.33V
c) 0.230V
b) 39V
d) 36V

25. Which element(s) has no effect in the given circuit?



a) 7Ω
c) Both 7Ω and 10Ω
b) 10Ω
d) Voltage source.

26. The value of current source is _____ after replacing the given network with a single current source and a resistor.

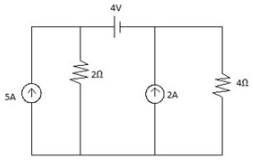


a) 70V
c) 90V
b) 60V
d) **80V**

27. If there is a 12A current source in series with 2Ω and in parallel with a 4Ω resistor, then voltage V=?

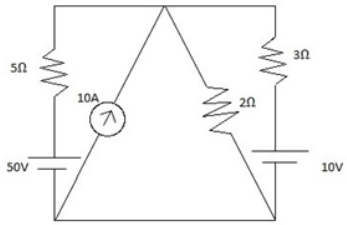
a) 24V
b) 48V
c) 3V
d) 6V

28. Find the current flowing through 4Ω resistor shown in network below.



a) 1.33A
b) 2.35A
c) 1.66A
d) 2.66A

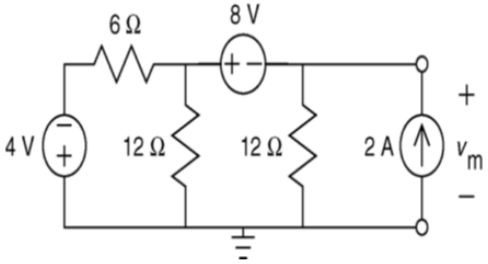
29. Calculate the power delivered by the 50V source.



a) 274W
b) 276W
c) 285W
d) 291W

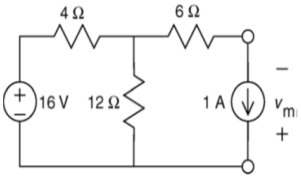
30. Source transformation can be used for dependent sources.
a) True
b) False

31. Using source transformation, calculate vm.



a) 2v
b) -2v
c) 1v
d) -1v

32. Find the voltage value Vm in the circuit given below.



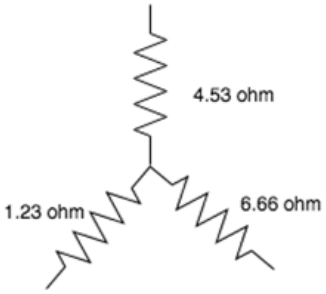
a) -3V
b) 3V
c) 2.1V
d) -2.1V

33. Source transformation technique is mainly based on _____ law.
a) Newton's
c) Ohm's
b) Kirchhoff's
d) Einstein's

34. In source transformation,
    a) Voltage sources remain same
    b) Current sources remain same
    c) Both voltage and current sources undergo change
    d) **Resistances/Impedances remain same**

35. If there are five 20V voltage sources in parallel, then in source transformation _____
    a) All are considered
    b) Only one is considered
    c) All are ignored
    d) Only 2 are considered

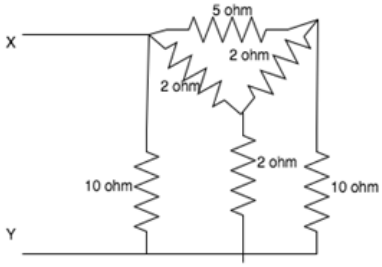
36. Find the equivalent delta circuit.



    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

37. 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) 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

38. Find the equivalent resistance between X and Y.



    a) 3.33 ohm
    b) 4.34 ohm
    c) 5.65 ohm
    d) 2.38 ohm

39. 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

40. 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
c) Ra+Rb+Ra*Rc/Rb
b) Rc+Rb+Ra*Rb/Rc
d) Rc+Rb+Rc*Ra/Rb

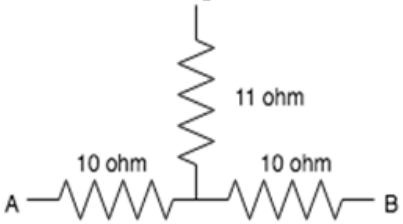
41. Ra is resistance at A, Rb is resistance at B, Rc is resistance at C in star connection. After transforming to delta, what is resistance between A and C?
a) Ra+Rb+Ra*Rb/Rc
c) Ra+Rb+Ra*Rc/Ra
b) Ra+Rc+Ra*Rc/Rb
d) Ra+Rc+Ra*Rb/Rc

42. 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
c) Ra+Rb+Ra*Rb/Rc
b) Ra+Rb+Ra*Rc/Rb
d) Ra+Rc+Ra*Rc/Rb

43. 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
c) 33 ohm, 19.67 ohm, 3.19 ohm
b) 33 ohm, 18.67 ohm, 3.19 ohm
d) 34 ohm, 19.67 ohm, 3.19 ohm

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

45. Find the equivalent resistance between A and B.



a) 32ohm
c) 30ohm
b) 31ohm
d) 29ohm

46. Source transformation technique is mainly based on _____ law.
a) Newton's
c) Ohm's
b) Kirchhoff's
d) Einstein's

47. In source transformation,
a) Voltage sources remain same
b) Current sources remain same
c) Both voltage and current sources undergo change
d) **Resistances/Impedances remain same**

48. If there are two resistors in parallel and in series with a voltage source then _____
a) Parallel resistor has no effect
b) Series resistor has no effect
c) Both has their respective effects
d) Both has no effect on the voltage source

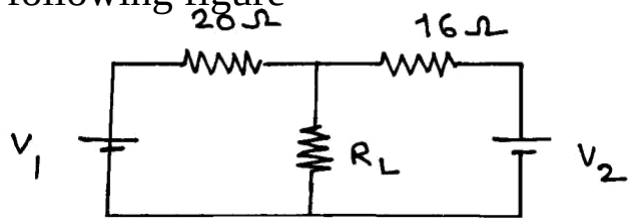
NETWORK THEOREMS

Position in Question Paper **Total Marks-24**

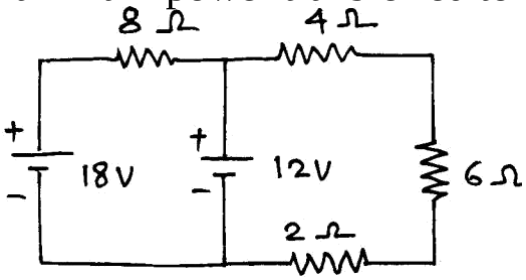
Q.1. f) 2-Marks.
g) 2-Marks.
Q.3. e) 4-Marks.
Q.4. d) 4-Marks.
Q.5. c) 6-Marks.
Q.6. c) 6-Marks.

Descriptive Question

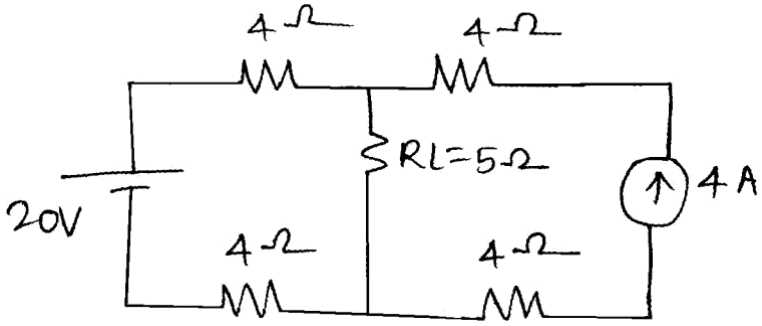
1. State 'Norton's' theorem with advantages, disadvantages, limitation, application and stepwise procedure to apply it.
2. State maximum power transfer theorem for AC circuits with advantages, disadvantages, limitation, and application and stepwise procedure to apply it.
3. State superposition theorem for AC and DC circuits with advantages, disadvantages, limitation, application and stepwise procedure to apply it.
4. State Thevenin's theorem with advantages, disadvantages, limitation, and application and stepwise procedure to apply it.
5. State Reciprocity theorem with advantages, disadvantages, limitation, and application and stepwise procedure to apply it.
6. Find R_{TH} from following figure



7. Find the value of maximum power transferred to R_L = 6W from the source of figure



8. Using Thevenin's theorem find current through 5W resistance. figure

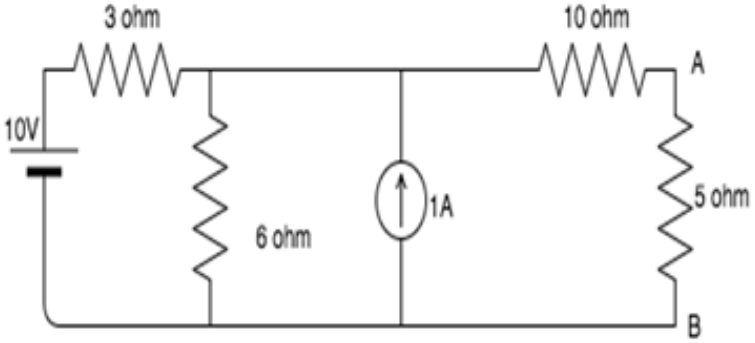


MCQ Question

(Total number of Question=Marks*3=24*3=72)

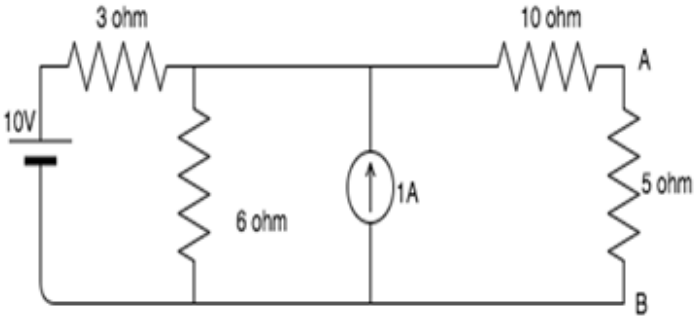
Note: Correct answer is marked with **bold.**

1. The Norton current is the_____
   a) **Short circuit current**
   b) Open circuit current
   c) Open circuit and short circuit current
   d) Neither open circuit nor short circuit current
2. Norton resistance is found by?
   a) Shorting all voltage sources
   b) Opening all current sources
   c) Shorting all voltage sources and opening all current sources
   d) Opening all voltage sources and shorting all current sources
3. Norton's theorem is true for _____
   a) **Linear networks**
   b) Non-Linear networks
   c) Both linear networks and nonlinear networks
   d) Neither linear networks nor non-linear networks
4. In Norton's theorem Isc is_____
   a) Sum of two current sources
   b) **A single current source**
   c) Infinite current sources
   d) 0
5. Isc is found across the _____ terminals of the network.
   a) Input
   b) **Output**
   c) Neither input nor output
   d) Either input or output
6. Can we use Norton's theorem on a circuit containing a BJT?
   a) Yes
   b) **No**
   c) Depends on the BJT
   d) Insufficient data provided
7. Calculate the Norton resistance for the following circuit if 5 ohm is the load resistance.



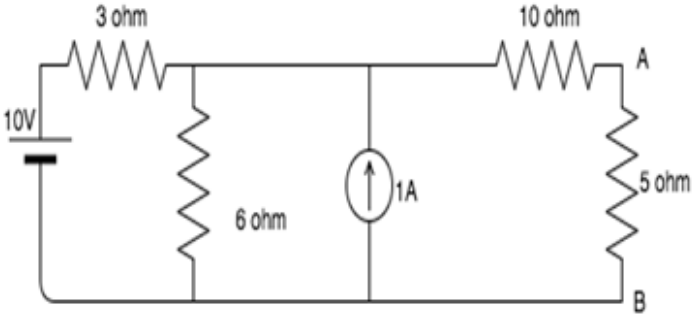
   a) 10 ohm
   b) 11 ohm
   c) **12 ohm**
   d) 13 ohm

8. Calculate the short circuit current is the 5 ohm resistor is the load resistance.



a) **0.72A**
b) 0.32A
c) 0.83A
d) 0.67A

9. Find the current in the 5 ohm resistance using Norton's theorem.



a) 1A
b) 1.5A
c) 0.25A
d) **0.5A**

10. Which of the following is also known as the dual of Norton's theorem?
a) **Thevenin's theorem**
b) Superposition theorem
c) Maximum power transfer theorem
d) Millman's theorem

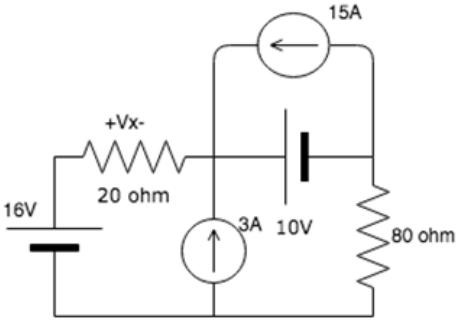
11. In superposition theorem, when we consider the effect of one voltage source, all the other voltage sources are _____
a) **Shorted**
b) Opened
c) Removed
d) Undisturbed

12. In superposition theorem, when we consider the effect of one current source, all the other voltage sources are _____
a) Shorted
b) Opened
c) Removed
d) Undisturbed

13. In superposition theorem, when we consider the effect of one voltage source, all the other current sources are _____
a) Shorted
b) **Opened**
c) Removed
d) Undisturbed

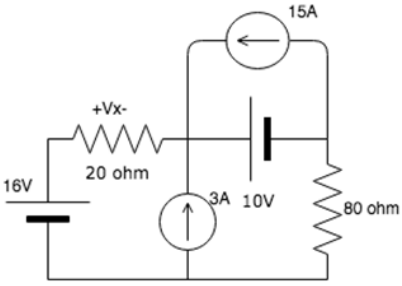
14. In superposition theorem, when we consider the effect of one current source, all the other current sources are _____
a) Shorted
b) **Opened**
c) Removed
d) Undisturbed

15. Find the value of Vx due to the 16V source.



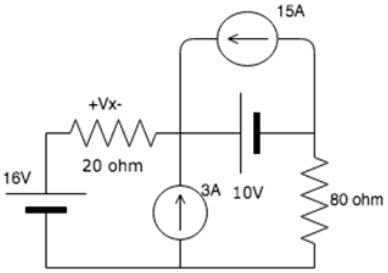
a) 4.2V
b) 3.2V
c) 2.3V
d) 6.3V

16. Find Vx due to the 3A source.



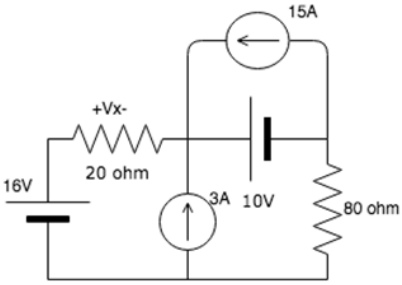
a) 56V
b) 78V
c) 38V
d) 48V

17. Find the value of Vx due to the 10V source.



a) 1V
b) 2V
c) 3V
d) 4V

18. Find the voltage due to the 15A source.



a) 0V
b) 2V
c) 4V
d) 6V

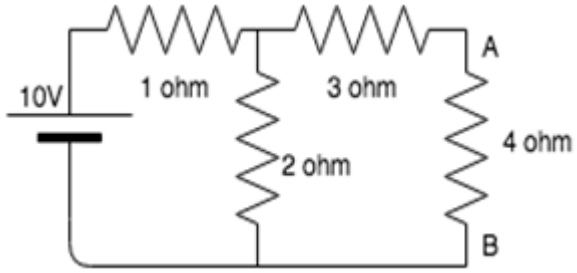
19. Superposition theorem is valid for _____

a) Linear systems
b) Non-linear systems

c) Both linear and non-linear systems
d) Neither linear nor non-linear systems

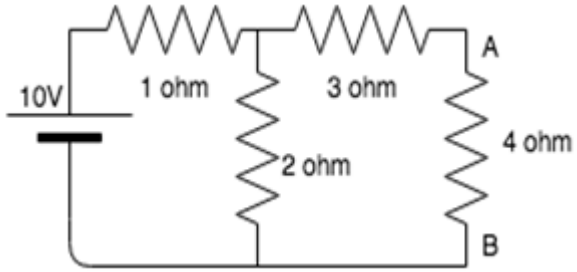
20. Superposition theorem does not work for _____
a) Current
b) Voltage
c) Power
d) Works for all: current, voltage and power

21. Calculate the Thevenin resistance across the terminal AB for the following circuit.



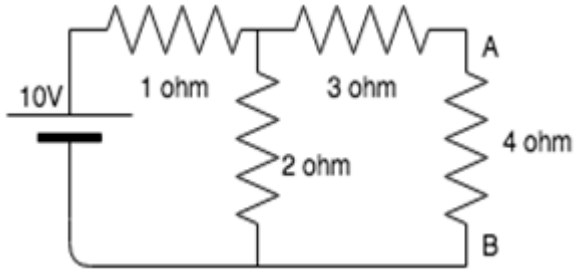
a) 4.34 ohm
b) 3.67 ohm
c) 3.43 ohm
d) 2.32 ohm

22. Calculate V_{th} for the given circuit.



a) 5.54V
b) 3.33V
c) 6.67V
d) 3.67V

23. Calculate the current across the 4 ohm resistor.



a) 0.86A
b) 1.23A
c) 2.22A
d) 0.67A

24. The Thevenin voltage is the_____
a) Open circuit voltage
b) Short circuit voltage
c) Open circuit and short circuit voltage
d) Neither open circuit nor short circuit voltage

25. Thevenin resistance is found by _____

a) Shorting all voltage sources
b) Opening all current sources
c) Shorting all voltage sources and opening all current sources
d) Opening all voltage sources and shorting all current sources

26. Thevenin's theorem is true for _____
a) Linear networks
b) Non-Linear networks
c) Both linear networks and nonlinear networks
d) Neither linear networks nor non-linear networks

27. In Thevenin's theorem Vth is _____
a) Sum of two voltage sources
b) A single voltage source
c) Infinite voltage sources
d) 0

28. Vth is found across the _____ terminals of the network.
a) Input
b) Output
c) Neither input nor output
d) Either input or output

29. Which of the following is also known as the dual of Thevenin's theorem?
a) Norton's theorem
b) Superposition theorem
c) Maximum power transfer theorem
d) Millman's theorem

30. Can we use Thevenin's theorem on a circuit containing a BJT?
a) Yes
b) No
c) Depends on the BJT
d) Insufficient data provided

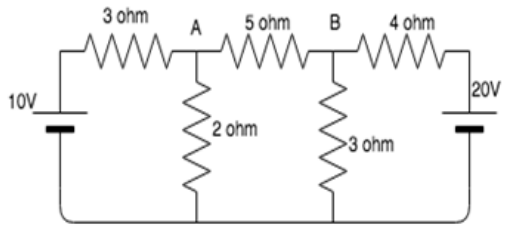
31. The maximum power drawn from source depends on _____
a) Value of source resistance
b) Value of load resistance
c) Both source and load resistance
d) Neither source or load resistance

32. The maximum power is delivered to a circuit when source resistance is _____ load resistance.
a) Greater than
b) Equal to
c) Less than
d) Greater than or equal to

33. If source impedance is a complex number Z, then load impedance is equal to _____
a) Z'
b) -Z
c) -Z'
d) Z

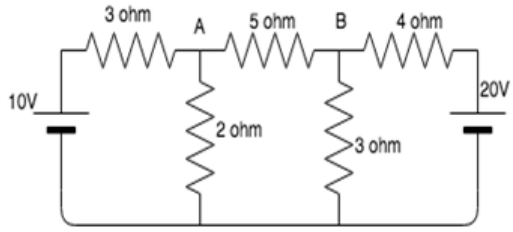
34. If ZL=Zs', then RL=?
a) -RL
b) Rs
c) -Rs
d) 0

35. Calculate the value of RL across A and B.



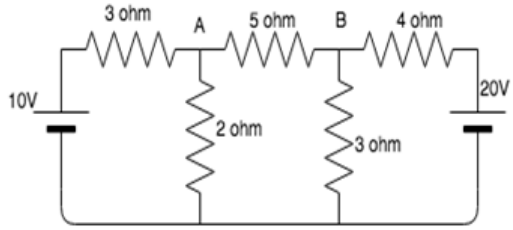
a) 3.45ohm
b) 2.91ohm
c) 6.34ohm
d) 1.54ohm

36. Calculate Eth.



a) 3.43V
c) 3.23V
b) 4.57V
d) 5.34V

37. Calculate the maximum power transferred.



a) 1.79W
c) 5.67W
b) 4.55W
d) 3.78W

38. Does maximum power transfer imply maximum efficiency?

a) Yes
c) Sometimes
b) No
d) Cannot be determined

39. Under the condition of maximum power efficiency is?

a) 100%
c) 30%
b) 0%
d) **50%**

40. Name some devices where maximum power has to be transferred to the load rather than maximum efficiency.

a) Amplifiers
b) Communication circuits
c) Both amplifiers and communication circuits
d) Neither amplifiers nor communication

41. To check for the Reciprocity Theorem we consider _____ of response to excitation.

a) Ratio
c) Product
b) Addition
d) subtraction

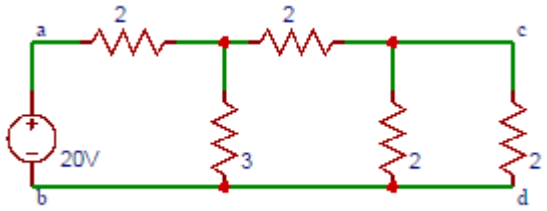
42. For the Reciprocity Theorem to satisfy the ratio of response to excitation before and after the source is replaced should be?

a) different
b) Same
c) before source is replaced is greater than after the source is replaced
d) before source is replaced is less than after the source is replaced

43. The circuit which satisfies Reciprocity Theorem is called?

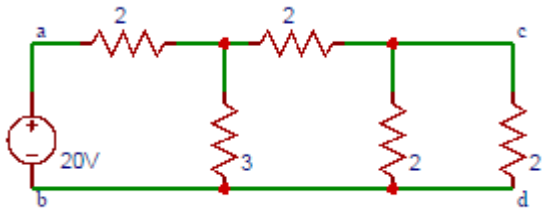
a) Short circuit
c) Linear circuit
b) Open circuit
d) Non-linear circuit

44. Find the current through the 2Ω(c-resistor in the circuit shown below.



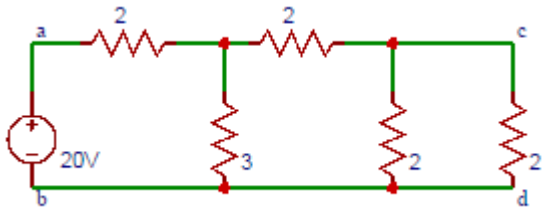
a) 0.143
b) 1.43
c) 14.3
d) 143

45. In the following circuit, the current drawn by 2Ω resistor (a-after the source is replaced is?



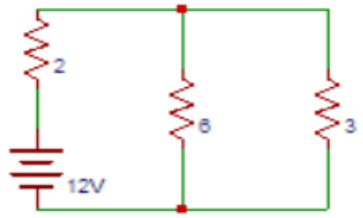
a) 143
b) 14.3
c) 1.43
d) 0.143

46. The following circuit satisfies Reciprocity Theorem.



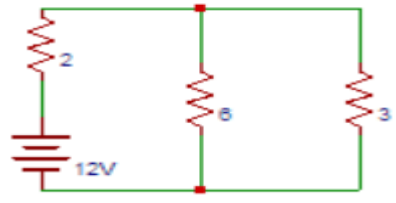
a) True
b) False

47. Find the current through 3Ω resistor in the circuit shown below.



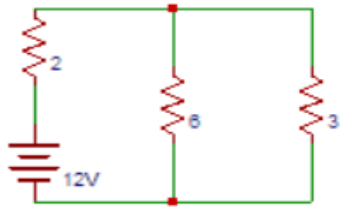
a) 1
b) 2
c) 3
d) 4

48. Find the current through 2Ω resistor after source is replaced in the below circuit.



a) 4
c) 2
b) 3
d) 1

49. The following circuit satisfies the reciprocity theorem.

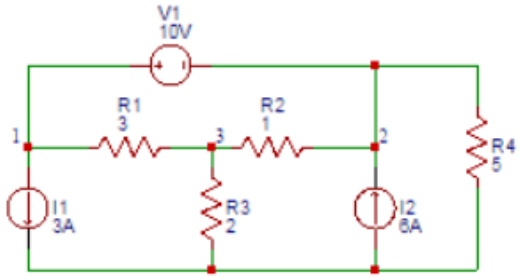


a) False
b) **True**

50. While considering Reciprocity theorem, we consider ratio of response to excitation as ratio of?

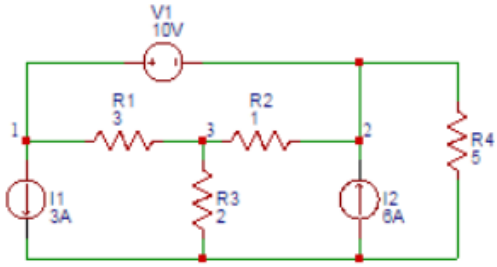
a) voltage to voltage
c) voltage to current
b) current to current
d) none of the mentioned

51. Consider the figure shown below. Find the voltage (V) at node 1.



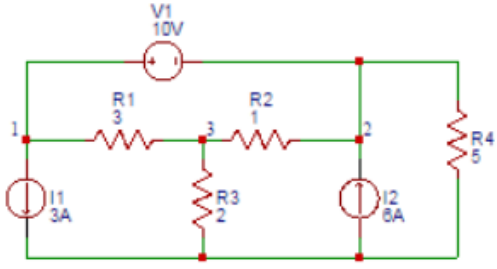
a) 13
c) 15
b) 14
d) 16

52. Consider the figure shown below. Find the voltage (V) at node 2.



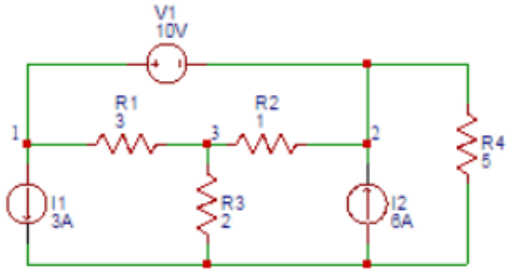
a) 3
c) 5
b) 4
d) 6

53. Consider the figure shown below. Find the voltage (V) at node 3.



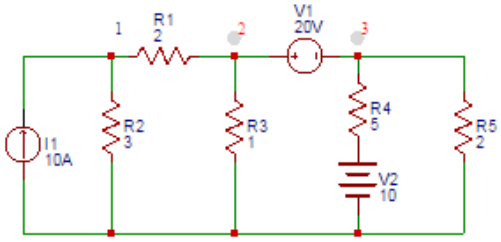
a) 4.5
c) 6.5
b) 5.5
d) 7.5

54. Consider the figure shown below. Find the power (W) delivered by the source 6A.



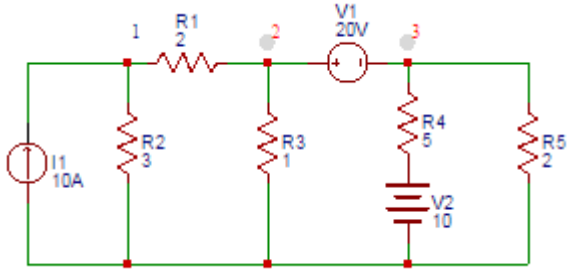
a) 20.3
c) 22.3
b) 1.3
d) 24.3

55. Find the voltage (V) at node 1 in the circuit shown below.



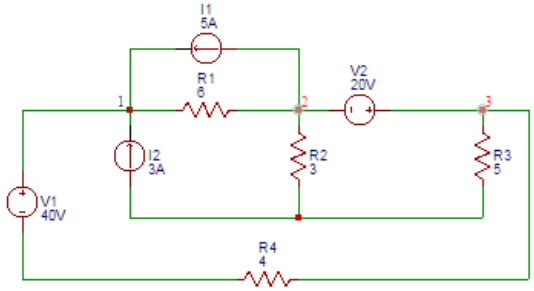
a) 18
c) 20
b) 19
d) 21

56. Consider the figure shown below. Find the voltage (V) at node 2.



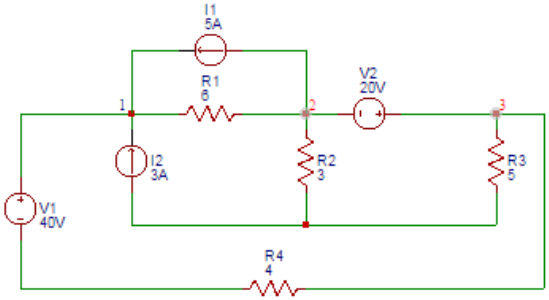
a) 11.5
c) 12.5
b) 12
d) 13

57. Find the voltage (V) at node 3 in the figure shown below.



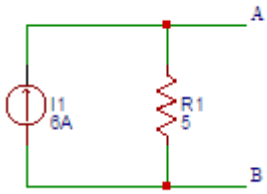
a) 18
c) 22
b) 20
d) 24

58. Find the power absorbed by 5Ω resistor in the following figure.



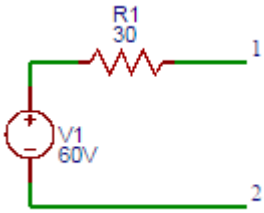
a) 60
b) 65.5
c) 70.6
d) 75

59. Find the value of the voltage (V) in the equivalent voltage source of the current source shown below.



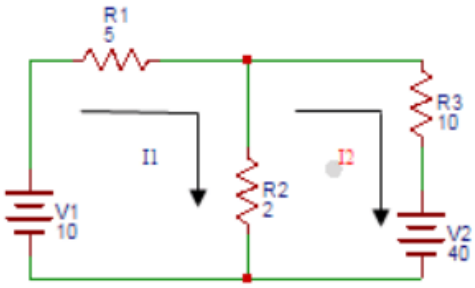
a) 20
b) 25
c) 30
d) 35

60. Find the value of the current (in the equivalent current source of the voltage source shown below.



a) 1
b) 2
c) 3
d) 4

61. Find current through R_2 resistor.



a) 3
b) 3.25
c) 3.5
d) 3.75

62. If there are 8 nodes in network, we can get ____ number of equations in the nodal analysis.

a) 9
c) 7
b) 8
d) 6

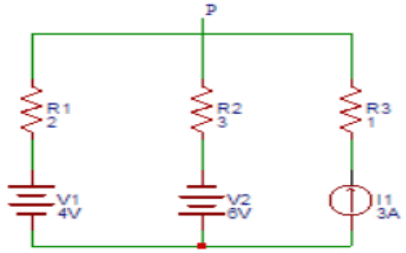
63. Nodal analysis can be applied for non planar networks also.

a) True
c) False

64. In nodal analysis how many nodes are taken as reference nodes?

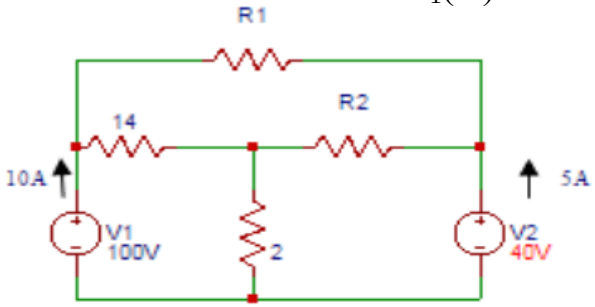
a) 1
c) 3
b) 2
d) 4

65. Find the voltage at node P in the following figure.



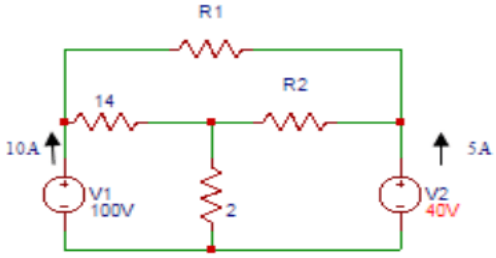
a) 8V
c) 10V
b) 9V
d) 11V

66. Find the resistor value $R_1(\Omega)$ in the figure shown below.



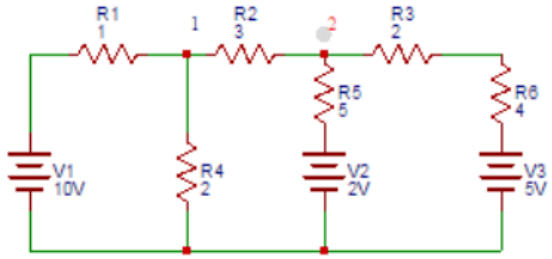
a) 10
c) 12
b) 11
d) 13

67. Find the value of the resistor R_2 (Ω) in the circuit shown below.



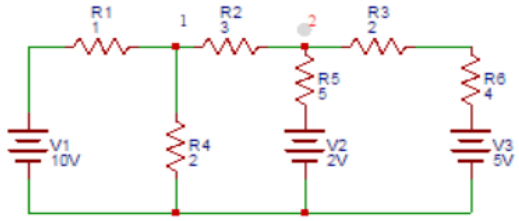
a) 5
c) 7
b) 6
d) 8

68. Find the voltage (V) at node 1 in the circuit shown.



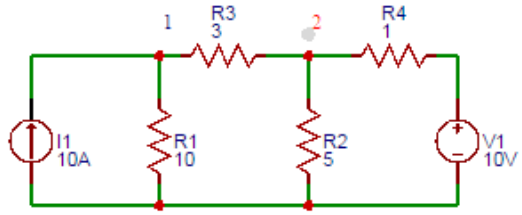
a) 5.32
c) 7.32
b) 6.32
d) 8.32

69. Find the voltage (V) at node 2 in the circuit shown below.



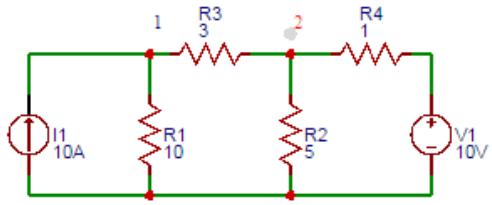
a) 2.7
c) 4.7
b) 3.7
d) 5.7

70. Find the voltage at node 1 of the circuit shown below.



a) 32.7
c) 34.7
b) 33.7
d) 35.7

71. Find the voltage at node 2 of the circuit shown below.



a) 13
c) 15
b) 14
d) 16

72. In nodal analysis how many nodes are taken as reference nodes?

a) 1
c) 3
b) 2
d) 4