Assignment-I

Date of Issue- 13-09-2019 **Date of Submission- 19.09.2019**

Printed Pages: 6

1. **What do you mean by Bilateral and Unilateral elements? Explain with examples.**
2. **What are Active and Passive networks? Explain with examples.**
3. **An alternating current varying sinusoidally with a frequency of 50 Hz has an rms value of 20A. Write down equation for the instantaneous value and find its value (a) 0.0025 sec (b) 0.0125 sec after passing through a positive maximum value. At what time measured from a positive maximum value , will the instantaneous current be 14.14 A? Ans: 20A, -20A, 1/300 sec.**
4. **Find the rms value, avg value and form factor of the voltage wave form shown in fig1.**

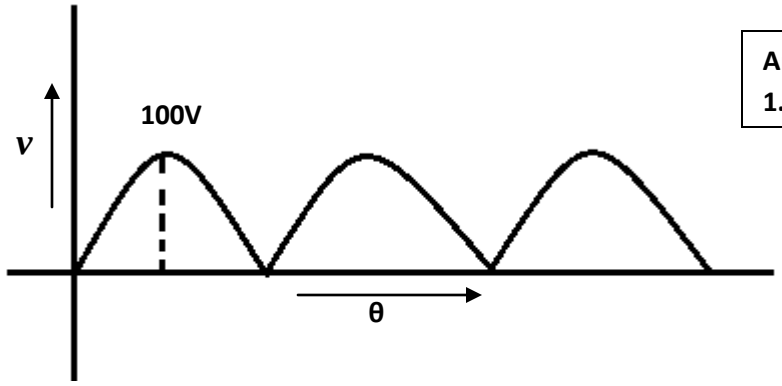


Figure 1

Ans: 70.71V, 63.66V, 1.11

5. **Draw a phasor diagram showing the following voltages:**
   $v_1 = 100\sin 500t$; $v_2 = 200\sin\left(500t + \pi/3\right)$; $v_3 = -50\cos 500t$
   $v_4 = 150\sin\left(500t - \pi/4\right)$. **Find rms value of resultant voltage. Ans: 216.72 V**
6. **Three circuits in parallel take currents which can be represented by,** $i_1 = 10\sin 314t$ **;**
   $i_2 = 7.5\sin\left(314t - \pi/3\right)$ **;** $i_3 = 12\sin\left(314t - \pi/4\right)$
   Sketch a phasor diagram to represent the three currents and their resultant. Express the resultant in the same form as the three individual current expressed above. What is rms value and the frequencies of the resultant current? Ans; $26.35\sin(314t - 0.584)$**; 18.63A; 50Hz**
7. **Show that average power demand in purely inductive and capacitive circuit is zero. Also draw wave form for instantaneous power in both circuits.**
8. **A 100V, 60W bulb is to be operated from 220 V supply. What resistance must be connected in series with the bulb to glow normally? Ans: 200 ohm.**
9. **The voltage and current through a circuit element are:** $v = 50\sin(314t + 55°)$ **volts and** $i = 10\sin(314t + 325°)$ **amperes. Find the value of power drawn by the element. Ans: 0**

10. **A resistance and inductance are connected in series across a voltage $v = 283\sin 314t$. An expression of current is found to be $i = 4\ \sin(314t - 45°)$. Find the values of resistance, inductance and power factor. Ans: $R = 50\Omega, L = 0.159H, 0.707\ lagging$**
11. **A non-inductive resistance of 10Ω is connected in series with an inductive coil across 200 V, 50Hz ac supply. The current drawn by series combination is 10A. The resistance of the coil is 2Ω. Determine: (i) inductance of coil (ii) power factor of coil and circuit (iii) quality factor of coil (iv) voltage across the coil. Ans: 0.051H, 0.124 lagg, 0.6 lagg, 8.0645, 161.245 V**
12. **A coil is connected in series with a non-inductive resistance of 30Ω across 240 V, 50 Hz supply. The reading of voltmeter across the coil is 180 V and across the resistance is 130 V. Calculate (a) power consumed by the coil and (b) power factor of the whole circuit. Ans: 138.34 W, 0.6747 lagging**
13. **The voltage applied to a circuit is $v = 100\sin(\omega t + 30°)$ and current is $i = 20\sin(\omega t + 60°)$. Determine the impedance, resistance, reactance, power and power factor of the circuit. Ans: 5Ω, 4.33Ω, 2.5Ω (capacitive), 866 watts, 0.866 leading.**
14. **A series R-L-C circuit is composed of 10Ωresistance, 0.1 H inductance and 50μF capacitance. A voltage $v(t) = 141.4\cos(100\pi t)$ volts is impressed upon the circuit. Determine (i) the expression for instantaneous current (ii) p.f of the circuit (iii) reactances of the circuit (iv) the voltage drop across resistance, inductance and capacitance (iv) Active, Reactive and Apparent powers. Ans: $4.1866\cos(\omega t + 72.778°)$, 0.2960 leading, 3.14Ω, 63.66Ω, 29.6V, 92.944V, 188.43V, 87.616 watts, 282.7 Var, 296 volt-ampere.**
15. **In a coil, the inductance being 50mH , the impedance is 20Ω, if the power factor of the circuit is 0.5 lag. Find the values of angular frequency and resistance of the coil. Ans: 346.41 rad/sec, 10Ω**
16. **The instantaneous values of the voltage across a two element series circuit and the current flowing through it are given by $v = 100\sin\left(314t - {}^{\pi}/_{4}\right)$ volts, $i = 20\sin(314t - 90°)$ amperes. Find the frequency and the circuit elements. Ans: 50Hz, 3.536Ω, 11.26mH**
17. **A coil of resistance 8Ω and inductance 0.12H is connected in series with a condenser of capacitance 140μF across a 230 volts, 50Hz supply. Determine: (i) Impedance of the entire circuit. (ii) Current flowing through the condenser. (iii) Power factor of the circuit. (iv) Voltage across the condenser. Ans: 16.97Ω, 13.55A, 0.4714 lagg, 308.2 V**
18. **Apply mesh analysis, obtain the current through 5Ω resistance in the following circuit in fig.2.**

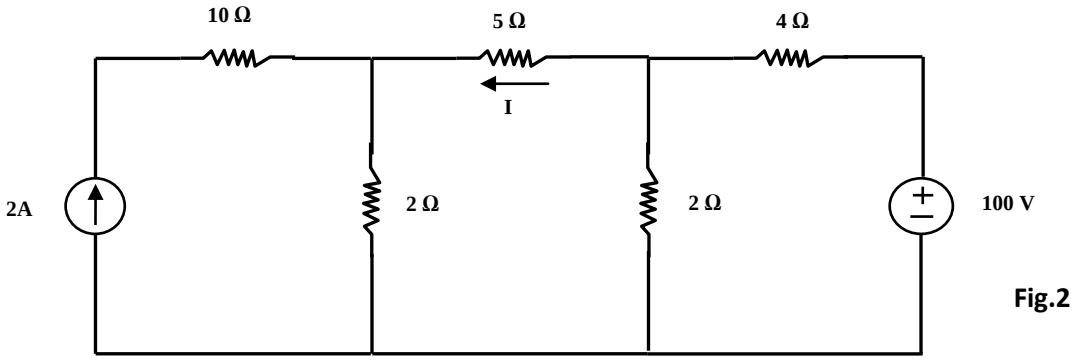


Fig.2

Ans: 3.52A

19. Find the currents in the various resistors using nodal analysis. (fig.3)
Ans: $I_1 = 1.6508A \;\; I_2 = 2.3151A \;\; I_3 = 6.025A \;\; I_4 = 0.949A \;\; I_5 = 1.0186A \; I_6 = 1.297A$

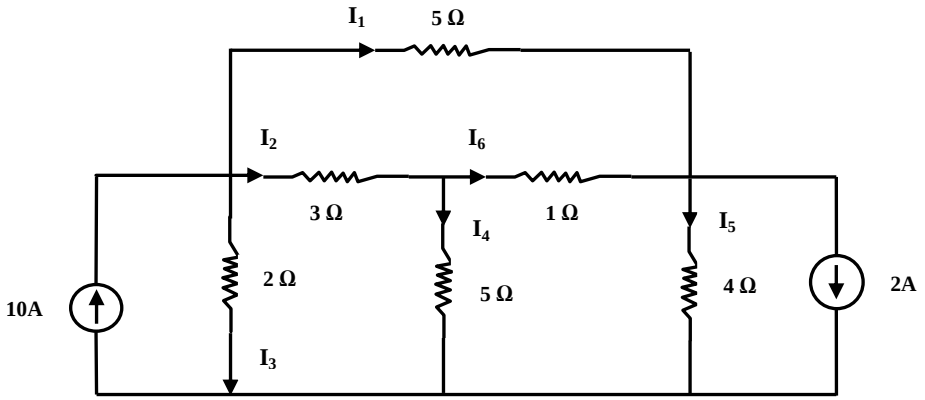
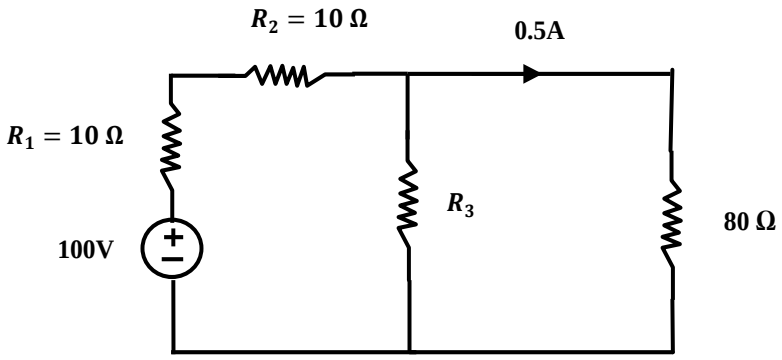


Fig.3

20. Find the voltage drop across R_1 and R_2 (see in fig.4). The resistance R_3 is not specified.



Ans: 30V, 30V

Fig.4

21. Using Nodal Analysis, find the current through 10Ω resistor in figure 5.

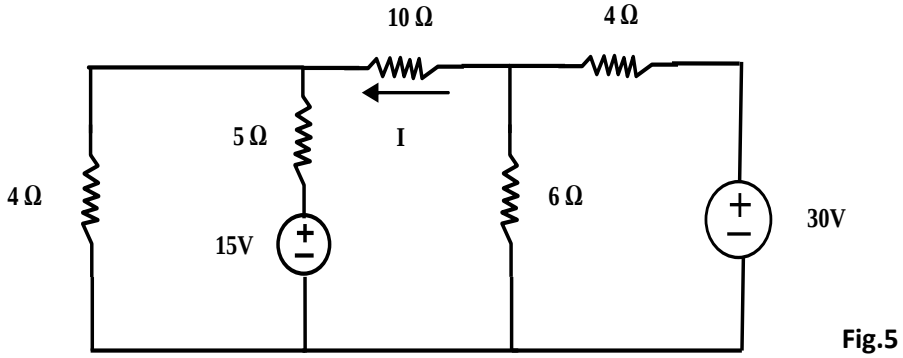


Fig.5

Ans: 0.7751A

22. Using superposition theorem calculate the current in AB branch in the circuit shown in fig.6.

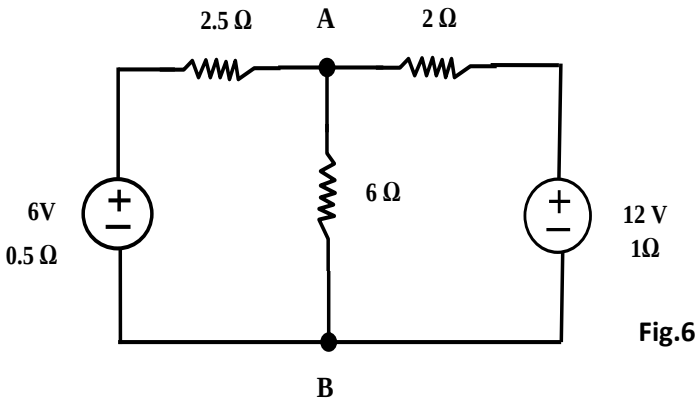


Fig.6

Ans: 1.2 A (A to B)

23. Using superposition theorem finds the current in 20Ω resistor of the circuit shown in fig.7.

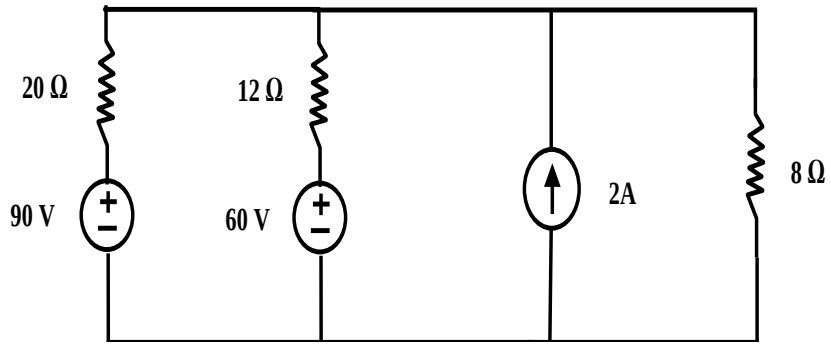


Fig.7

Ans: 2.2742 ↑

24. Determine current in 4Ω resistance using Thevenin's theorem in the circuit given in fig.8.

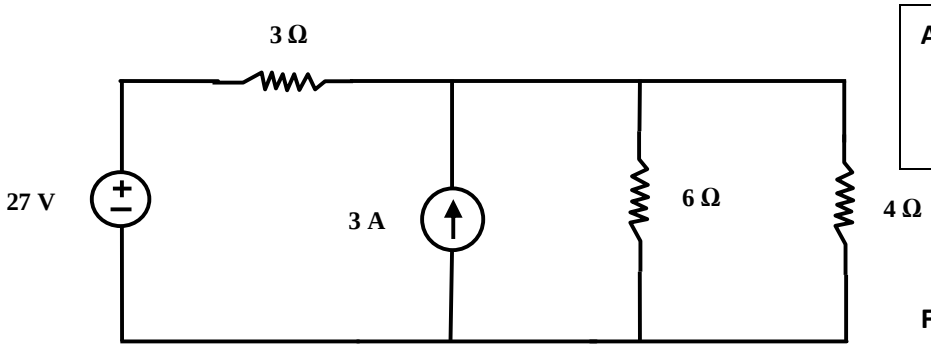
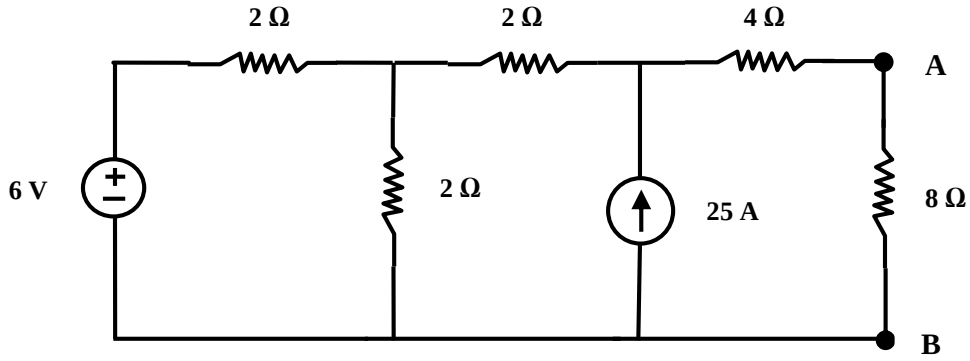


Fig.8

Ans: V_{th}= 24V
R_{th}= 2Ω
I_L= 4A

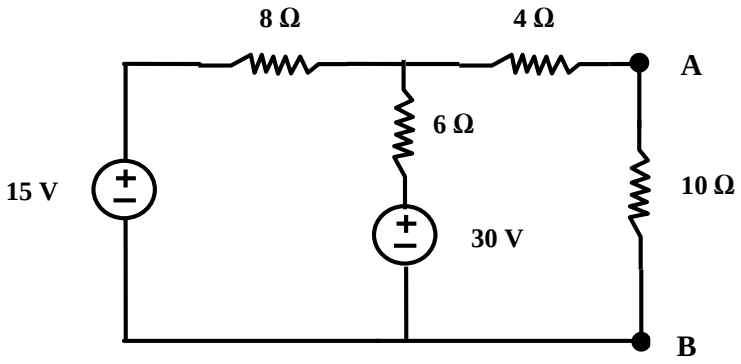
25. Determine open circuit voltage across AB terminals and the equivalent resistance from AB terminal of the circuit shown in figure 9 using Thevenin's theorem. Also find current in 8 Ω resistance.



Ans: V_{TH}= 78V
R_{TH} = 7Ω
I_L= 5.2A

Fig.9

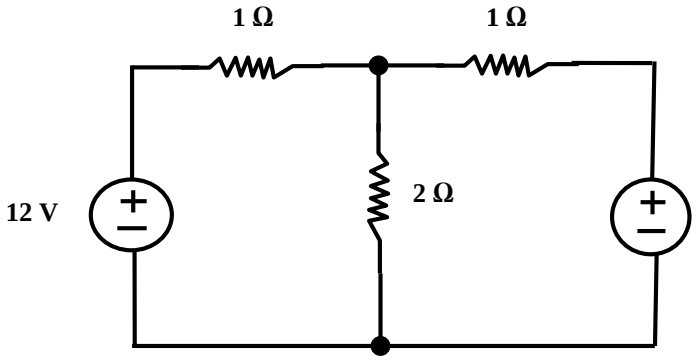
26. Determine current in 10Ω resistance using Norton,s theorem in the following network. Fig.10.



Ans: I_N = 3.173 A
R_N = 7.428Ω
I_L = 1.3524 A

Fig. 10

27. Using Norton's theorem determines the current flowing through 2Ω resistance in the fig.11.



Ans: I_N = 18 A
R_N = 0.5Ω
I_L = 3.6 A ↓

Fig.11

28. Using star-delta transformation, find current supplied by the battery in circuit given in the figure 12.

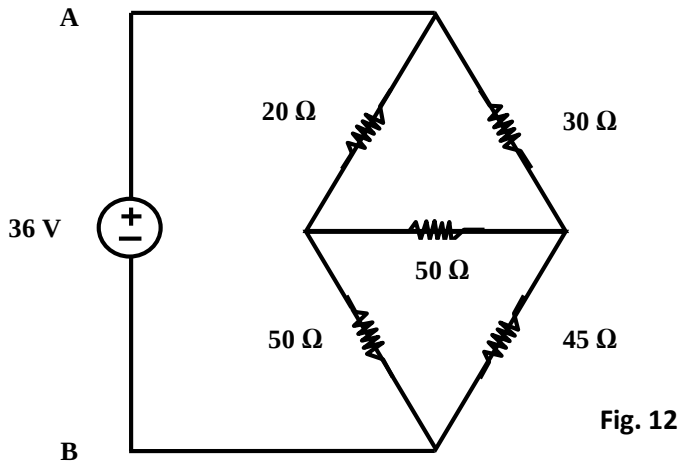


Fig. 12

Ans: 1 A