ASSIGNMENT-1

1. Use mesh analysis to find the current in each resistor in Fig. 3.15.

[in 100 Ω = 0·1 A from *L* to *R* ; in 20 Ω = 0·4 A from *R* to *L* ; in 10 Ω = 0·5 A downward]

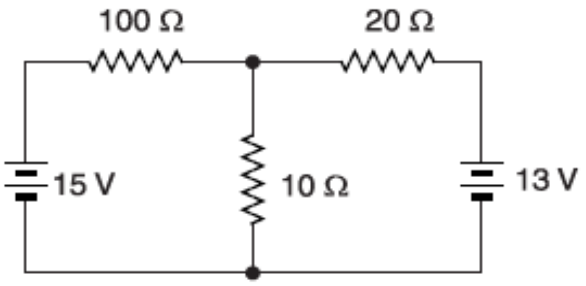


Fig. 3.15

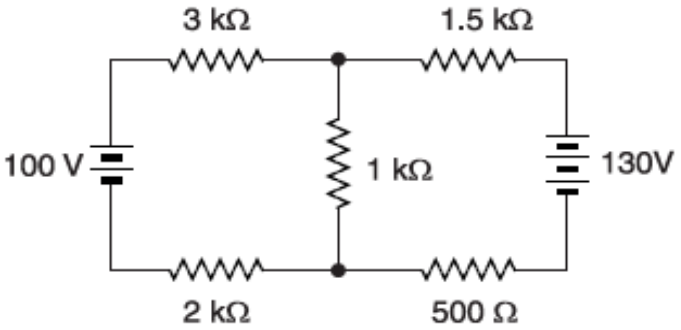


Fig. 3.16

2. Using mesh analysis, find the voltage drop across the 1 kΩ resistor in Fig. 3.16. **[50 V]**

3. Using mesh analysis, find the currents in 50 Ω, 250 Ω and 100 Ω resistors in the circuit shown in Fig. 3.17. **[*I*(50 Ω) = 0·171 A → ; *I*(250 Ω) = 0·237 A ← ; *I*(100 Ω) = 0·408 A ↓]**

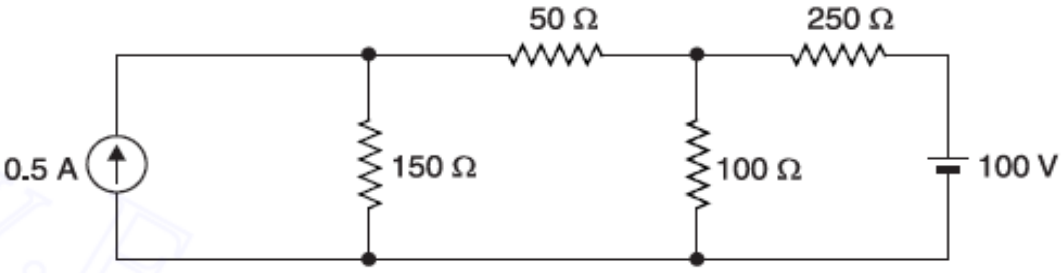


Fig. 3.17

4. For the network shown in Fig. 3.18, find the mesh currents I_1, I_2 and I_3. **[5 A, 1 A, 0·5 A]**

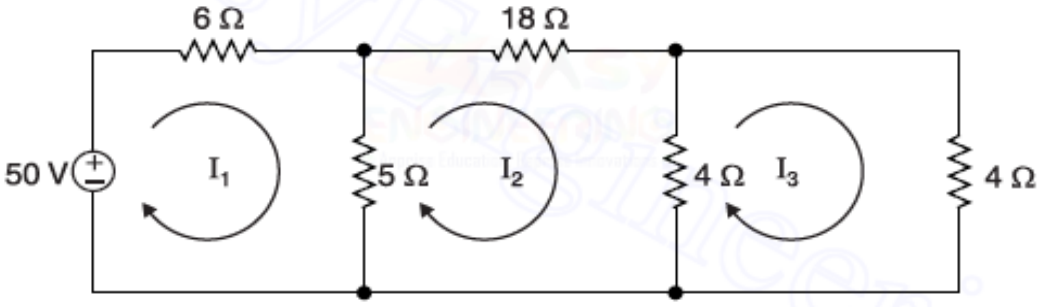


Fig. 3.18

5. In the network shown in Fig. 3.19, find the magnitude and direction of current in the various branches by mesh current method. **[*FAB* = 4 A ; *BF* = 3 A ; *BC* = 1 A ; *EC* = 2 A ; *CDE* = 3 A]**

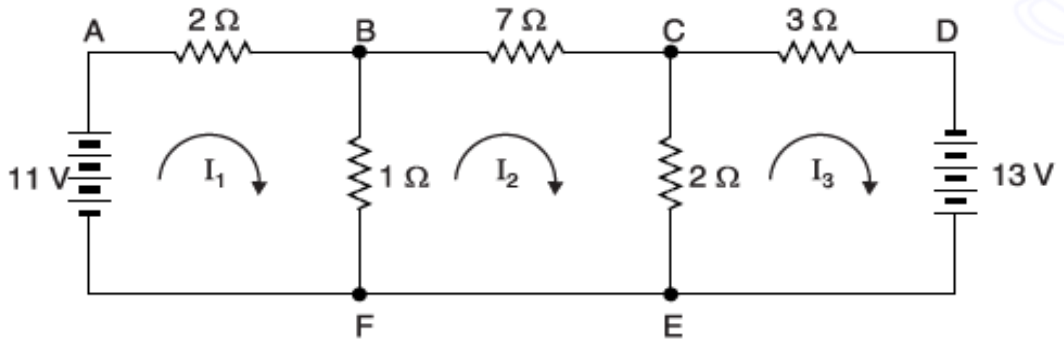
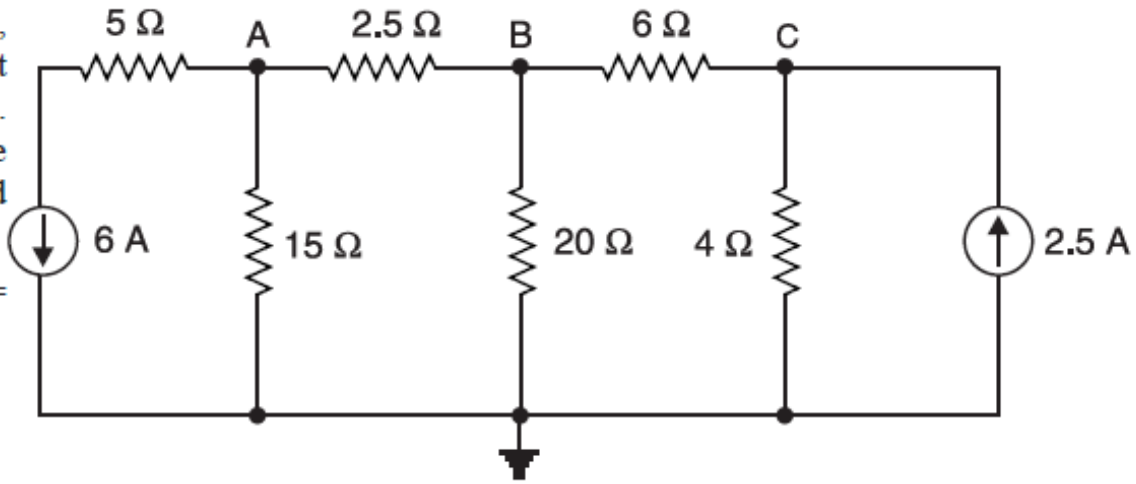


Fig. 3.19

ASSIGNMENT:2

1. Using nodal analysis, find the voltages at nodes A, B and C w.r.t. the reference node shown by the ground symbol in Fig. 3.39. [$V_A = -30V$; $V_B = -20V$; $V_C = -2V$]



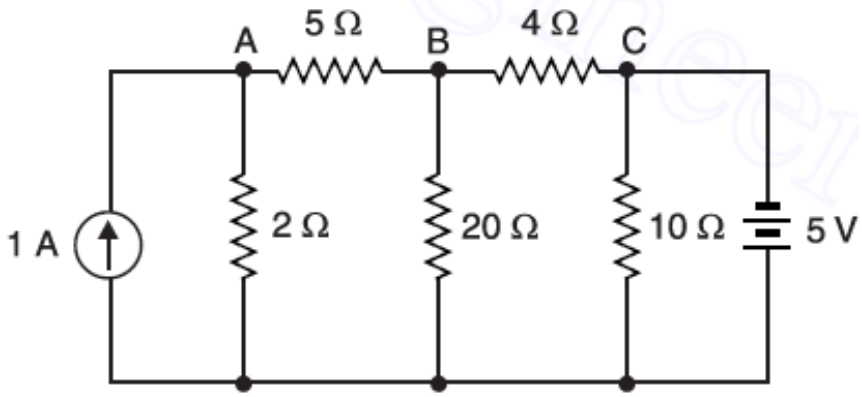


Fig. 3.44

2. Find Node Voltage In Figure 3.44. **(Ans. VA=0.806 V, VB=-2.18 V , VC=-2.5 V)**

3. Using nodal analysis find the current through the battery In Figure **3.44.** **(Ans. 1.21 A)**

Assignment-3

1. For the circuit shown in Fig.1 below calculate the current taken by circuit.

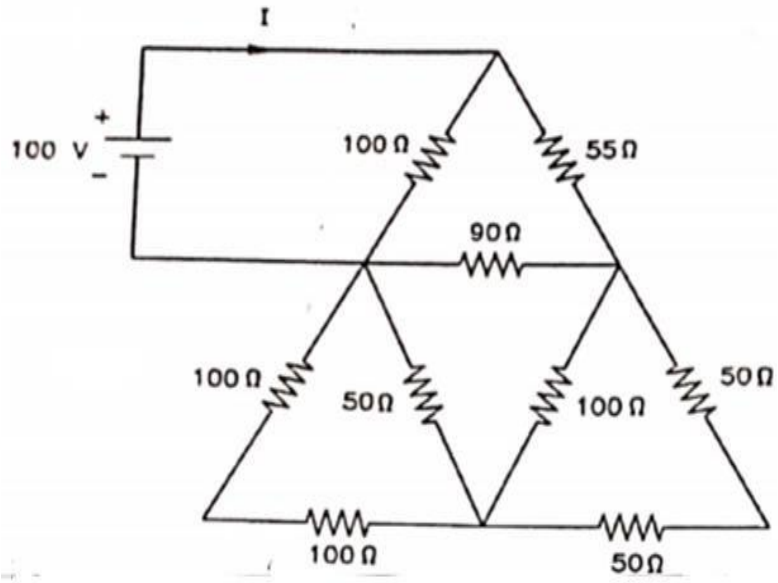


Fig.1

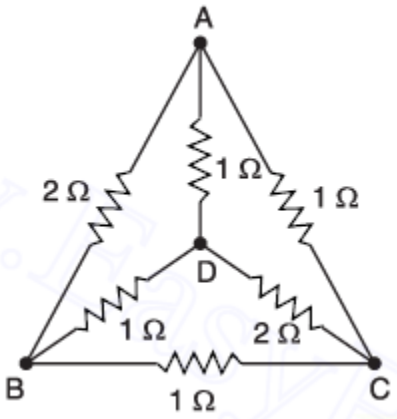


Fig.2

2. In the network shown in Fig.2, find the resistance between terminals B and C using star/delta transformation.

3. Find the current supplied by the battery in the network shown in Fig.3.

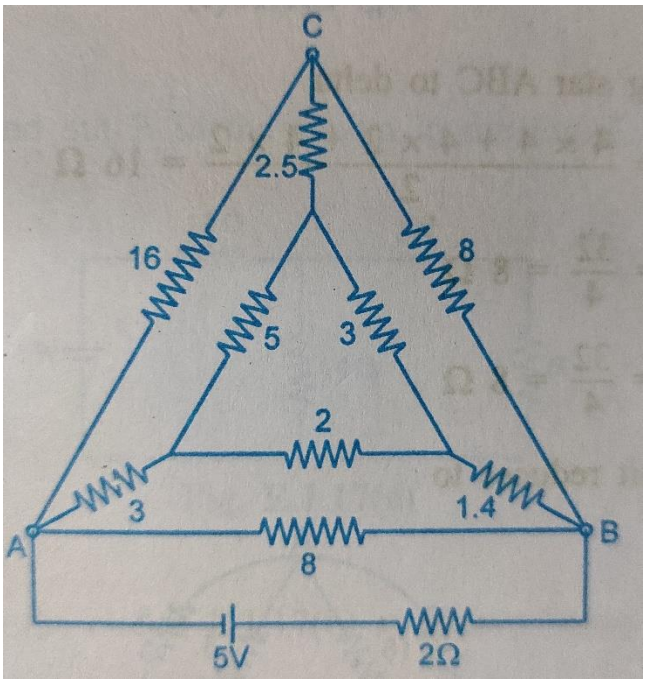


Fig.3.

Assignment-4

Q.1 *Two series connected parallel plate capacitors have plate areas of 0·2 m^2 and 0·04 m^2, plate separation of 0·5 mm and 0·125 mm and relative permittivities of 1 and 6 respectively. Calculate the total voltage across the capacitors that will produce a potential gradient of 100 kV/cm between the plates of first capacitor.*

Ans. V=6.04 Kv

Q.2. *A capacitor is composed of two plates separated by 3mm of dielectric of permittivity 4. An additional piece of insulation 5mm thick is now inserted between the plates. If the capacitor now has capacitance one-third of its original capacitance, find the relative permittivity of the additional dielectric.*

Ans. $\therefore \varepsilon_{r2} = 20/6 = 3{\cdot}33$

3 A capacitor is being charged from a d.c. source through a resistance of 2MΩ. If it takes 0·2 second for the charge to reach 75% of its final value, what is the capacitance of the capacitor ? **Ans. 16.67*10^-4 F**

4. A 8 μF capacitor is connected is series with 0·5 MΩ resistance across 200 V supply. Calculate (*i*) initial charging current (*ii*) the current and p.d. across capacitor 4 seconds after it is connected to the supply.
[(*i*) 400 μA (*ii*) 147 μA; 126·4 V]

5. What resistance connected in series with a capacitance of 4μF will give the circuit a time constant of 2 seconds ? **[500 kΩ]**

6 A series *RC* circuit is to have an initial charging current of 4 mA and a time constant of 3·6 seconds when connected to 120 V d.c. supply. Calculate the values of *R* and *C*. What will be the energy stored in the capacitor ? **[30 kΩ ; 120 μF ; 0·864 J]**

7. A 20μF capacitor initially charged to a p.d. of 500V is discharged through an unknown resistance. After one minute, the p.d. at the terminals of the capacitor is 200 V. What is the value of the resistance ?
[3·274 MΩ]

Assignment-5

Q.1 A ring has mean diameter of 15 cm, a cross–section of 1.7 cm^2 and has a radial gap of 0.5 mm cut in it. It is uniformly wound with 1500 turns of insulated wire and a current of 1 A produces a flux of 0.1 mWb across the air gap. Calculate the relative permeability of iron on the assumption that there is no magnetic leakage.

Ans. Relative permeability=174

Q.2 The self inductance of a coil of 500 turns is 0.25 H. If 60% of the flux is linked with a second coil of 10500 turns, calculate :–

(i) the mutual inductance between the coils and

(ii) e.m.f. induced in the second coil when current in the first coil changes at the rate of 100 A/sec

Ans. 1). M=3.15 H

2). E= 315 V

ASSIGNMENT-6

1. An alternating voltage is represented by :

$$v = 141{\cdot}4 \sin 377\, t$$

Find (*i*) the maximum value (*ii*) frequency (*iii*) time period and (*iv*) the instantaneous value of voltage when t is 3 ms. **[(*i*) 141·4V (*ii*) 60 Hz (*iii*) 16·67 ms (*iv*) 127·8 V]**

2. An alternating current of frequency 50Hz has a maximum value of $200\sqrt{2}$A Reckoning the time from the instant the current is zero and becoming positive, find the time taken by the current to reach a value of 141·4A for a first and second time. **[1·67 ms ; 21·67 ms]**

3. An alternating current takes 3·375 ms to reach 15 A for the first time after becoming instantaneously zero. The frequency of current is 40 Hz. Find the maximum value of alternating current. **[20A]**

4. A 50 Hz sinusoidal voltage has a maximum value of 56·56 V. Find the value of voltage 0·0025 second after passing through maximum positive value. At what time measured from a positive maximum value will instantaneous voltage be 14·14 V ? **[40V ; 4·2 ms]**

5. An alternating current of frequency 50 Hz has a maximum value of 100A. Calculate its value 1/300 second after the instant the current is zero and its value is decreasing thereafter. **[−86·6 A]**

ASSIGNMENT-7

1. Determine the inductance required to series-resonate with a 180 pF capacitor at 320 kHz. Also determine BW and Q if $R = 20\ \Omega$. **[L = 1·373 mH; BW = 2·32 kHz ; Q = 138]**

2. A series LC circuit has an inductance of 200 μH, a capacitance of 300 pF and a Q of 60. Determine f_r, BW and upper and lower cut-off frequencies.

[f_r = 649.75 kHz ; BW = 10·83 kHz ; 655.16 kHz ; 644.34 kHz]

3. A resistance of 15 Ω and an inductance of 4H and a capacitance of 25 μF are connected in series across 230 V a.c. supply. Calculate (*i*) the frequency at which the current shall be maximum (*ii*) current at this frequency and (*iii*) p.d. across inductance. **[(*i*) 15.9 Hz (*ii*) 15.33 A (*iii*) 6123 V]**

4. A circuit consists of a resistance of 12 Ω, capacitance of 320 μF and an inductance of 0.08 H, all in series. A supply of 240 V, 50 Hz is applied to the ends of the circuit. Calculate the frequency at which the circuit power factor would be unity. **[32 Hz]**

ASSIGNMENT-8

1. *Three coils, each having a resistance of 20 Ω and an inductive reactance of 15 Ω, are connected in star to a 400 V, 3-phase, 50 Hz supply. Calculate (i) the line current (ii) power factor and (iii) power supplied.*

2. *A 3-phase, 400 V, 50 Hz a.c. supply is feeding a 3-phase delta-connected load with each phase having a resistance of 25 Ω, an inductance of 0.15 H and a capacitor of 120 μF in series. Find line current, volt-amp, active power and reactive volt-amp.*