Q1.(I) Three loads, each of resistance 50Ω are connected in star to a 400V, 3-phase supply. Determine: (a) the phase voltage, (b) the phase current and (c) the line current.
[Ans: (a) 231V (b) 4.62A (c) 4.62A]

(II) Repeat above if the loads are connected in delta
[Ans: (a) 400V (b) 8A (c) 13.86A]

(III) Determine the phase sequence of the following set of voltages?

$$v_a(t) = 60\cos(wt + 50^0)$$
$$v_b(t) = 60\cos(wt - 70^0$$
$$v_c(t) = 60\cos(wt + 170^0)$$

[Ans: abc]

Q2.A set of 3 equal resistors, each of value R_x, connected in star across RYB of given Fig.1 consumes the same power as the unbalanced delta-connected load shown.
The value of R_x is _____ Ω.

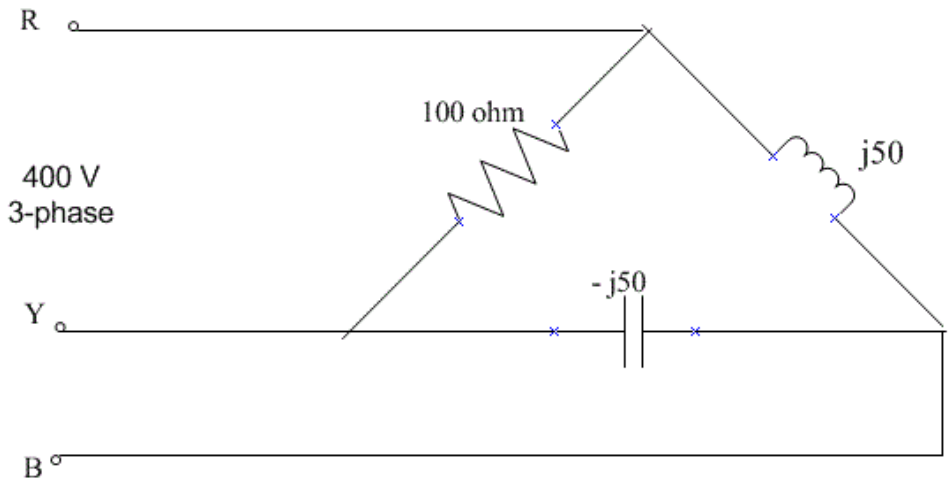

Fig. 1

[Ans: R_x = 100 Ω]

Q3.Three identical impedances of $10\Omega \angle -15^0$ are Y –connected to balanced three phase line voltage of 208V. Specify all the line and phase voltages and currents as phasors in polar form with V_{ca} as reference for phase sequence of ABC. Also draw the phasor diagram.

[Ans: $\boldsymbol{V_{an} = 120\,V\angle\,210^0, V_{bn} = 120\,V\angle\,90^0, V_{cn} = 120\,V\angle -30^0}$;

$$\boldsymbol{I_a = 12\,A\angle\,225^0, \quad I_b = 12\,A\angle\,105^0, I_c = 12\,A\angle -15^0;]}$$

Q4. A 415 V, three phase generator supplies power to both a delta and a star- connected load in the manner shown in Fig.2. All the phase impedances are identical and specifically equal to $(5 + j8.66)\Omega$. Compute the total generator current in each line.

[Ans:$\boldsymbol{I_a = 95.86\,A\angle -90^0, \quad I_b = 95.86\,A\angle\,150^0, I_c = 95.86\,A\angle 30^0;]}$

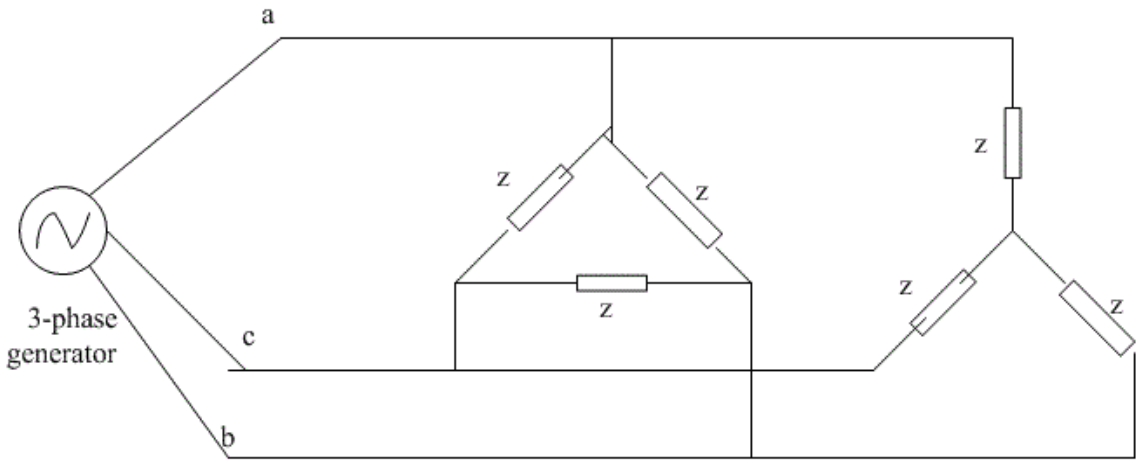

Fig. 2

Q5.Calculate all voltages, currents, and total power in this balanced Delta-Delta system shown in Fig 3:

[**Ans**: $\boldsymbol{E_{line} = 230\,V, I_{line} = 7.967\,A, E_{ph(source)} = 230V, I_{ph(source)} = 4.6A,}$

$\boldsymbol{E_{ph(load)} = 230\,V, I_{ph(load)} = 4.6\,A, P_{total} = 3.174\,kW]}$

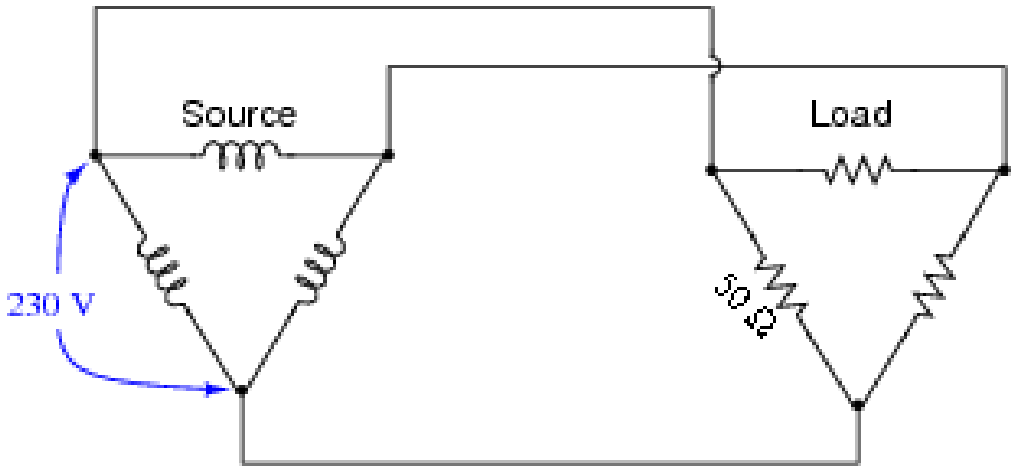

Fig. 3

Q6. An abc phase sequence, three phase balanced Y- connected source supplies a balances delta connected load as shown in Fig.4. The impedance per phase of the delta load is $Z = (12 + j9)\Omega$. If the line impedance is zero and the line current in the 'a' phase is $I_{aA} = 24\angle 16.27^0$. The load voltage V_{AB} is _____

[Ans: $208\,V\angle 83.13^0$]

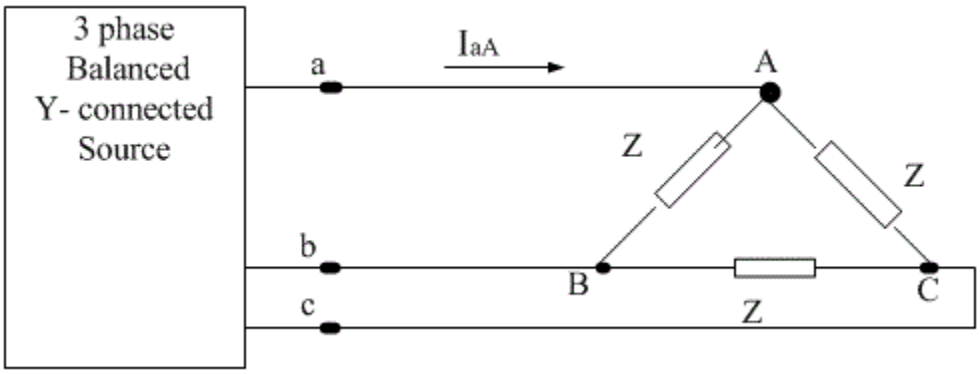

Fig. 4

Q7.Each phase of a star connected load consist of a non-reactive resistance of 100 Ω in parallel with a capacitor of 31.8 μF. Calculate line current and power absorbed, total KVA and power factor when connected to a 416 V, 3 phase 50 Hz supply.

[Ans: (2.4+j2.4) A; 1728 W; 2.443 KVA; 0.707(lead)]

Q8. A three-phase balanced wye-delta system has a line voltage of 208 V (rms). The total real power absorbed by the load is 1200 W. If the power factor angle of the load is 20° lagging, determine the magnitude of the line current and the magnitude of the load impedance per phase in the delta.

[Ans: 3.54 A (rms); (95.34+j34.70) Ω]

Q9. A high-voltage generator is connected to a 3-phase wye connected load through a transmission line. Each phase of the line has impedanceZ_l, and the load is a balanced wye with branch impedance Z. Line to line voltage,$|V_{ab}| = 45\ kV, Z_l = (0.5 + j3)\Omega$, $Z_l = (4.5 + j9)\Omega$. Find the line current magnitude, active power consumed by the load and line losses. Draw the phasor diagram.
[Ans: 2 kA; 54 MW; 6 MW]

Q10. (I) A 3 phase, 3-wire supply feeds a star connected load consisting of 3 equal resistors. If one of the resistors is to be removed, then what is the reduction in power as compared to the original power?
[Ans: 50% of the original power]

(II) Three 100 Ω non inductive resistors are connected in
(a) Star,
(b) Delta
across a 400V, 50 Hz supply. Calculate power taken from supply in each case. Also, In the event of one of the resistance gets opened, then what would be the value of total power taken from mains in each of the above two cases

[Ans: 1600W, 4800W, 800W, 3200W]