Started on	Sunday, 19 February 2017, 3:40 PM
State	Finished
Completed on	Sunday, 19 February 2017, 3:54 PM
Time taken	13 mins 28 secs
Grade	**94.17** out of 100.00

Question 1

Correct

Mark 10.00 out of 10.00

P11.1_10ed

What is the phase sequence of each of the following sets of voltages?

a) v_a = 137 cos(ωt + 63°) V v_b = 137 cos(ωt - 57°) V v_c = 137 cos(ωt + 183°) V

abc – Positive Phase Sequence: ✓

b) v_a = 820 cos(ωt -36°) V v_b = 820 cos(ωt + 84°) V v_c = 820 sin(ωt - 66°) V

acb – Negative Phase Sequence: ✓

a) abc – Positive Phase Sequence

b) acb – Negative Phase Sequence

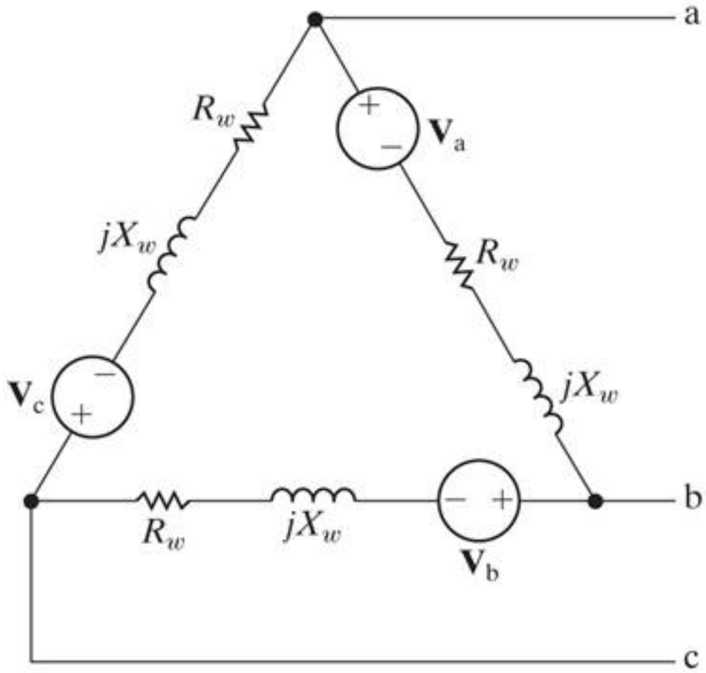
Correct

Marks for this submission: 10.00/10.00.

Question 2

Correct

Mark 10.00 out of 10.00



P11.4_10ed

Assume that nodes a,b,c are “open circuited” with no external connections.

Given: v_a = 188 cos(ωt + 60°) V v_b = -188 cos(ωt) V v_c = 188 cos(ωt - 60°) V

Determine the current circulating in this Δ-connected generator.

I_Δ = 0 A

IΔ = zero A

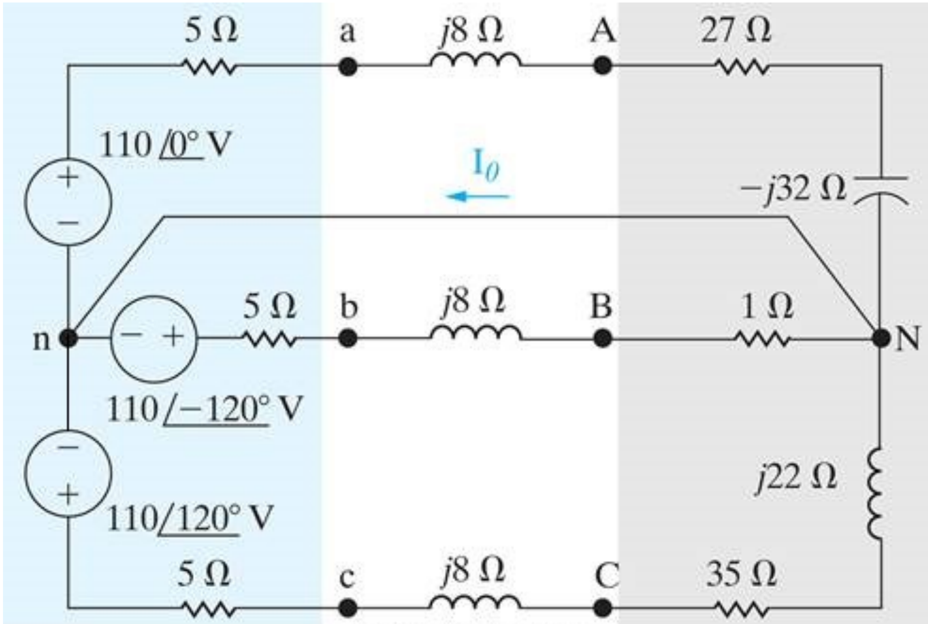
Correct

Marks for this submission: 10.00/10.00.

Question 3

Correct

Mark 10.00 out of 10.00



P11.6_10ed

Given that all voltages are rms values.

a) Find the current $\mathbf{I}_{aA}$.

$\mathbf{I}_{aA}$ = 2.2 + j 1.65 A_{rms}

b) Find the current $\mathbf{I}_{bB}$.

$\mathbf{I}_{bB}$ = -10.92 + j -1.3 A_{rms}

c) Find the current $\mathbf{I}_{cC}$.

$\mathbf{I}_{cC}$ = 0.26 + j 2.18 A_{rms}

d) Find the current $\mathbf{I}_0$ as shown in the circuit.

$\mathbf{I}_0$ = -8.46 + j 2.52 A_{rms}

e) Is this circuit a balanced or unbalanced three-phase system?

Balanced/Unbalanced? Unbalanced

a) $\mathbf{I}_{aA}$ = 2.20 + j 1.650 A_{rms}

b) $\mathbf{I}_{bB}$ = -10.9210 – j 1.3158 A_{rms}

c) $\mathbf{I}_{cC}$ = 0.2632 + j 2.1842 A_{rms}

d) $\mathbf{I}_0$ = -8.4579 + j 2.5184 A_{rms}

e) The system is unbalanced since the current $\mathbf{I}_0$ does not equal zero.

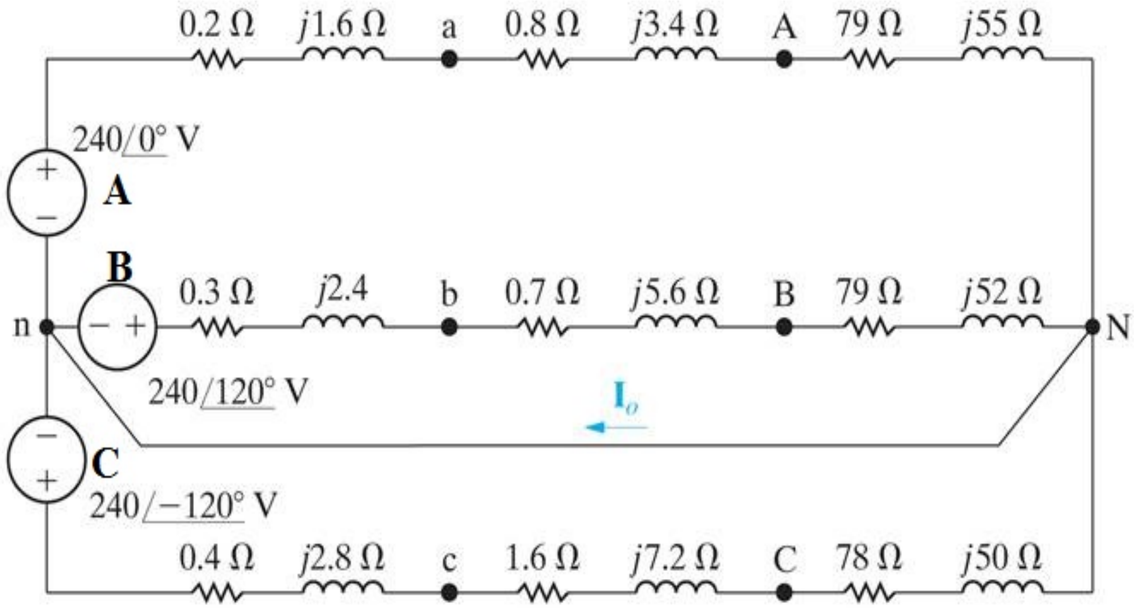
Correct

Marks for this submission: 10.00/10.00.

Question 4

Correct

Mark 10.00 out of 10.00



P11.6_8ed

a) Find the current $\mathbf{I_0}$ as shown in the circuit.

$\mathbf{I_0}$ = 0 A

b) Find the voltage $\mathbf{V_{AN}}$.

$\mathbf{V_{AN}}$ = 230.88 + j -8.14 V

c) Find the voltage $\mathbf{V_{AB}}$.

$\mathbf{V_{AB}}$ = 332.08 + j -211.32 V

d) Is this circuit a balanced or unbalanced three-phase system?

Balanced/Unbalanced? Unbalanced

Numeric Answer

a) $\mathbf{I_0}$ = 0 A

b) $\mathbf{V_{AN}}$ = 230.8804 – j 8.1432 V

c) $\mathbf{V_{AB}}$ = 332.0867 – j 211.317 V

d) The system is unbalanced since the voltages V_{AN}, V_{BN} and V_{CN} will not equal zero.

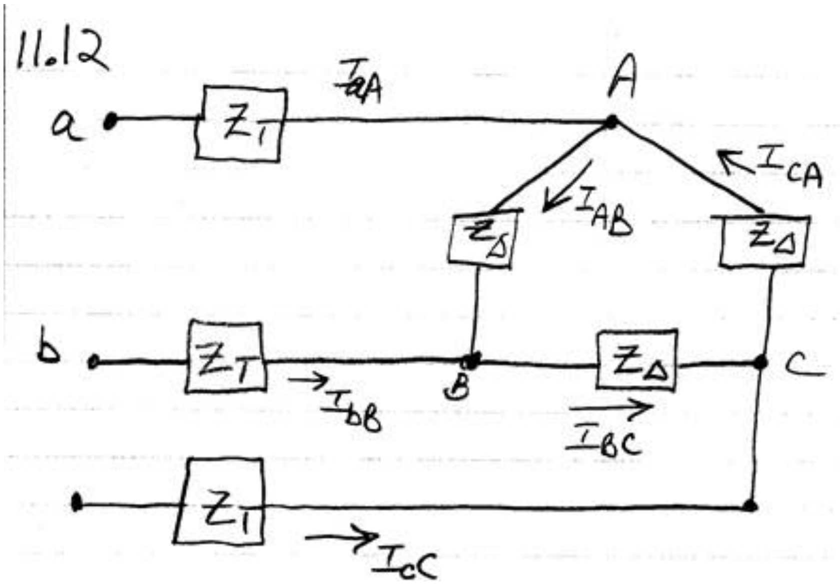
Correct

Marks for this submission: 10.00/10.00.

Question 5

Partially correct

Mark 9.44 out of 10.00



P11.12_8ed

A balanced Δ-connected load has an impedance of Z_Δ = 360 + j 105 W/f.

The load is fed through a line have an impedance Z_T = 0.1 + j 1 W/f.

The phase voltage at the terminals of the load is 33 kV.

The phase sequence is positive.

Use $\mathbf{V}_{AB}$ as the zero angle reference.

a) Calculate the three phase currents in the load.

$\mathbf{I}_{AB}$ = 84.48 ✓ + j -24.64 ✓ A

$\mathbf{I}_{BC}$ = -63.58 ✓ + j -60.84 ✓ A

$\mathbf{I}_{CA}$ = -20.9 ✓ + j 85.48 ✓ A

b) Calculate the three line currents.

$\mathbf{I}_{aA}$ = 105.38 ✓ + j -110.12 ✓ A

$\mathbf{I}_{bB}$ = -148.06 ✓ + j -36.2 ✓ A

$\mathbf{I}_{cC}$ = 42.68 ✓ + j 146.32 ✓ A

c) Calculate the three line voltages at the sending end of the line.

$\mathbf{V}_{ab}$ = 33120.66 ✓ + j -104.22 ✗ V

$\mathbf{V}_{bc}$ = -16478.73 ✓ + j -28730.44 ✓ V

$\mathbf{V}_{ca}$ = -16641.93 ✓ + j 28636.22 ✓ V

Numeric Answer

a) $\mathbf{I}_{AB}$ = 84.48 - j 24.64 A

$\mathbf{I}_{BC}$ = -63.5789 - j 60.8418 A

$\mathbf{I}_{CA}$ = -20.9011 + j 85.4818 A

b) $\mathbf{I}_{aA}$ = 105.3812 - j 110.1218 A

$\mathbf{I}_{bB}$ = -148.0589 - j 36.2018 A

$\mathbf{I}_{cC}$ = 42.6777 + j 146.3237 A

c) $\mathbf{V}_{ab}$ = 33099.2073 + j 246.0432 V

$\mathbf{V}_{bc}$ = -16336.563 - j 28787.8438 V

$\mathbf{V}_{ca}$ = -16762.7226 + j 28541.8004 V

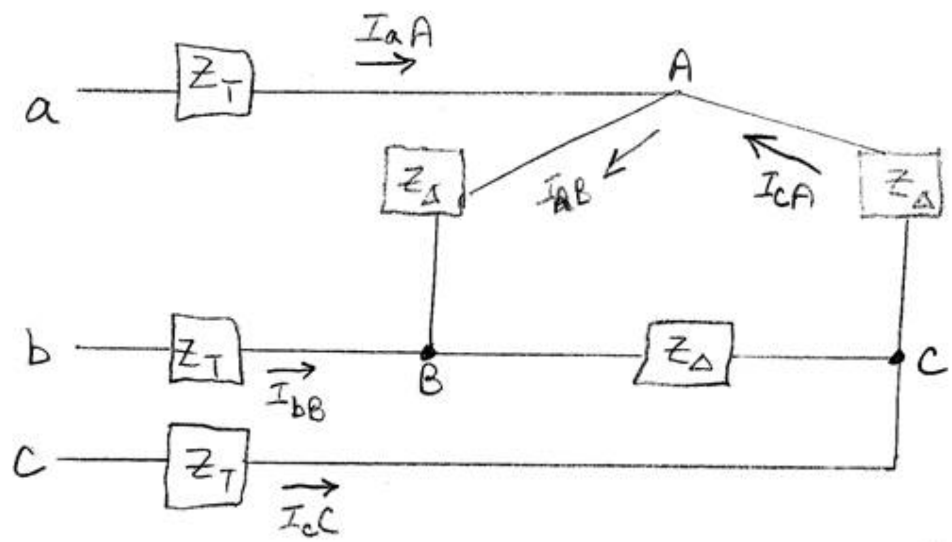
Partially correct

Marks for this submission: 9.44/10.00. Accounting for previous tries, this gives **9.44/10.00**.

Question 6

Partially correct

Mark 7.22 out of 10.00



P11.11_7ed

A balanced Δ-connected load has an impedance of Z_Δ = 60 + j 45 Ω/Φ.

The load is fed through a line have an impedance Z_T = 0.8 + j 0.6 Ω/Φ.

The phase voltage at the terminals of the load is $|\mathbf{V}_{AB}|$ = 480 V_{rms}.

The phase sequence is positive.

Use $\mathbf{V}_{AB}$ as the zero angle reference.

a) Calculate the three phase currents in the load.

$\mathbf{I}_{AB}$ = 5.12 + j -3.84 A_{rms}

$\mathbf{I}_{BC}$ = -5.89 + j -2.51 A_{rms}

$\mathbf{I}_{CA}$ = 0.77 + j 6.35 A_{rms}

b) Calculate the three line currents.

$\mathbf{I}_{aA}$ = 4.35 + j -10.19 A_{rms}

$\mathbf{I}_{bB}$ = -11.01 + j 1.326 A_{rms}

$\mathbf{I}_{cC}$ = 6.65 + j 8.87 A_{rms}

c) Calculate the three line voltages at the sending end of the line.

$\mathbf{V}_{ab}$ = 480 + j 0 V_{rms}

$\mathbf{V}_{bc}$ = -480 + j 0 V_{rms}

$\mathbf{V}_{ca}$ = 480 + j 0 V_{rms}

a) $\mathbf{I}_{AB}$ = 5.120 - j 3.840 A_{rms}

$\mathbf{I}_{BC}$ = -5.8855 - j 2.514 A_{rms}

$\mathbf{I}_{CA}$ = 0.7655 + j 6.3541 A_{rms}

b) $\mathbf{I}_{aA}$ = 4.3545 - j 10.1941 A_{rms}

$\mathbf{I}_{bB}$ = -11.0055 + j 1.3260 A_{rms}

$\mathbf{I}_{cC}$ = 6.6511 + j 8.8681 A_{rms}

c) $\mathbf{V}_{ab}$ = 499.2001 + j 0 V_{rms}

$\mathbf{V}_{bc}$ = -249.60 - j 432.320 V_{rms}

$\mathbf{V}_{ca}$ = -249.60 + j 432.320 V_{rms}

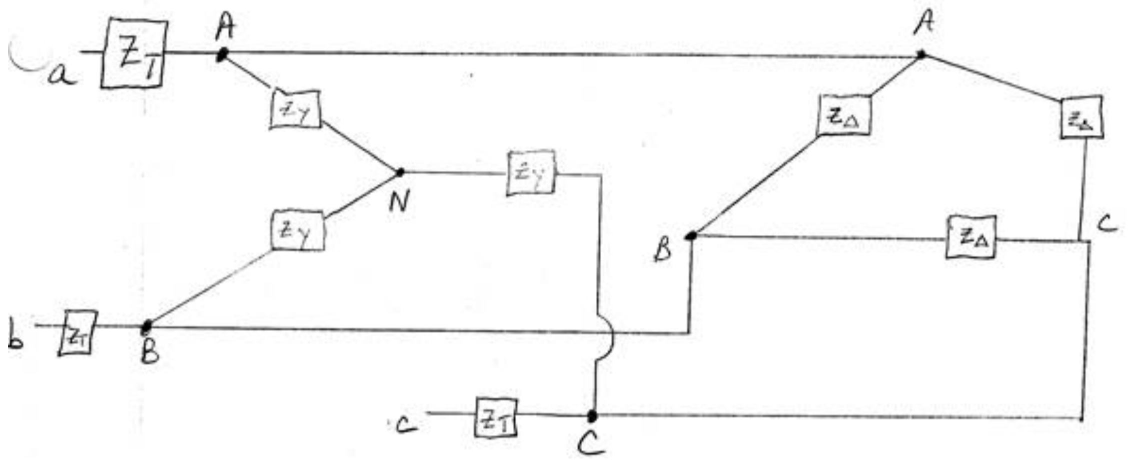
Partially correct

Marks for this submission: 7.22/10.00. Accounting for previous tries, this gives **7.22/10.00**.

Question 7

Partially correct

Mark 7.50 out of 10.00



P11.12_7ed

A balanced Y-connected load having an impedance of $Z_Y = 72 + j\,21\ \Omega/\Phi$ is connected in parallel with a balanced Δ-connected load having an impedance of $Z_\Delta = 150 + j\,0\ \Omega/\Phi$. The parallel loads are fed from a line having an impedance of $Z_T = 0 + j\,1\ \Omega/\Phi$. The magnitude of the line-to-neutral voltage of the Y-connected load is 7,650 V_{rms}.

a) Calculate the magnitude of the current in the line feeding the loads.

$|\mathbf{I}_{aA}| = |\mathbf{I}_{bB}| = |\mathbf{I}_{cC}| =$ 252.54 ✓ A_{rms}

b) Calculate the magnitude of the phase current in the Δ-connected load.

$|\mathbf{I}_{AB}| = |\mathbf{I}_{BC}| = |\mathbf{I}_{CA}| =$ -51 ✗ A_{rms}

c) Calculate the magnitude of the phase current in the Y-connected load.

$|\mathbf{I}_{AN}| = |\mathbf{I}_{BN}| = |\mathbf{I}_{CN}| =$ 102 ✓ A_{rms}

d) Calculate the magnitude of the line-to-line voltages at the sending end of the line.

$|\mathbf{V}_{AB}| = |\mathbf{V}_{BC}| = |\mathbf{V}_{CA}| =$ 13264.38 ✓ V_{rms}

a) $|\mathbf{I}_{aA}| = |\mathbf{I}_{bB}| = |\mathbf{I}_{cC}| = 252.5403\ A_{rms}$

b) $|\mathbf{I}_{AB}| = |\mathbf{I}_{BC}| = |\mathbf{I}_{CA}| = 88.3346\ A_{rms}$

c) $|\mathbf{I}_{AN}| = |\mathbf{I}_{BN}| = |\mathbf{I}_{CN}| = 102\ A_{rms}$

d) $|\mathbf{V}_{AB}| = |\mathbf{V}_{BC}| = |\mathbf{V}_{CA}| = 13306.755\ V_{rms}$

Partially correct

Marks for this submission: 7.50/10.00.

Question 8

Correct

Mark 10.00 out of 10.00

P11.13_8ed

A balanced Y-connected load has an impedance of $Z_Y = 96 - j\,28\ \Omega/\Phi$ is connected in parallel with a balanced Δ-connected load which has an impedance of $Z_\Delta = 144 + j\,42\ \Omega/\Phi$.

The parallel loads are fed from a (transmission) line having an impedance of $Z_T = 0 + j\,1.5$ Ω (Ohm).

The magnitude of the line-to-neutral voltage of the Y-connected load is $V_{AN} = 7500$ at angle 0° Volts.

a) Calculate the magnitude of the current in the line feeding the loads.

$|\mathbf{I}_{aA}| = |\mathbf{I}_{bB}| = |\mathbf{I}_{cC}| =$ 217.02 A

b) Calculate the magnitude of the phase current in the D-connected load.

$|\mathbf{I}_{AB}| = |\mathbf{I}_{BC}| = |\mathbf{I}_{CA}| =$ 86.6 A

c) Calculate the magnitude of the phase current in the Wye-connected load.

$|\mathbf{I}_{AN}| = |\mathbf{I}_{BN}| = |\mathbf{I}_{CN}| =$ 75 A

d) Calculate the magnitude of the line voltage at the sending end of the line.

$|\mathbf{V}_{AB}| = |\mathbf{V}_{BC}| = |\mathbf{V}_{CA}| =$ 13057 V

a) $|\mathbf{I}_{aA}| = |\mathbf{I}_{bB}| = |\mathbf{I}_{cC}| = 217.0184$ A

b) $|\mathbf{I}_{AB}| = |\mathbf{I}_{BC}| = |\mathbf{I}_{CA}| = 86.6025$ A

c) $|\mathbf{I}_{AN}| = |\mathbf{I}_{BN}| = |\mathbf{I}_{CN}| = 75.0$ A

d) $|\mathbf{V}_{AB}| = |\mathbf{V}_{BC}| = |\mathbf{V}_{CA}| =$ 13,0571.0059 V

Correct

Marks for this submission: 10.00/10.00.

Question 9

Correct

Mark 10.00 out of 10.00

P11.23_8ed

The total apparent power supplied in a balanced three-phase Y-Δ system is 3,600 VA. The load line-to-line voltage is 208 V_{rms}. If the line impedance is negligible and the power factor angle of the load is 25°, determine the impedance of the load.

$Z_{load,\Delta} =$ 32.67 + j 15.23 Ω (Ohms)

$Z_{load,\Delta} = 32.6754 + j\,15.2367$ Ω (Ohms)

Correct

Marks for this submission: 10.00/10.00.

Question 10

Correct

Mark 10.00 out of 10.00

P11.22_8ed

A balanced three-phase source is supplying 90 kVA at 0.8 lagging to two balanced Y-connected parallel loads. The distribution line connecting the source to the load has negligible impedance. Load 1 is purely resistive and absorbs 60 kW. Find the per-phase impedance of load 2 if the line voltage is 415.69 V_{rms} and the impedance components are in series.

$Z_{load,2}$ = 0.678 + j 3.05 W (Ohms)

$Z_{load,2}$ = 0.6776 + j 3.0494 W (Ohms)

Correct

Marks for this submission: 10.00/10.00.