Q3]3-Phase half -wave rectifier with delta-star transformer is connected to 10 Ω resistive load. For 220 V secondary line to line voltage and 50 Hz. Calculate

1- The dc load power 2- the conduction time of each diode.

Ans.

1) $$P = \frac{{V_{dc}}^2}{R} \qquad (1)$$

$$V_{dc} = \frac{3\sqrt{3}V_m}{2\pi} \qquad (2)$$

$$V_m = \frac{\sqrt{2}}{\sqrt{3}} \times 220 \qquad (3)$$

Sub. eq (3) in eq(2)

$$V_{dc} = \frac{3\sqrt{3}\times\frac{\sqrt{2}}{\sqrt{3}}\times 220}{2\pi} = 149\ volt$$

$$P = \frac{{V_{dc}}^2}{R} = \frac{149^2}{100} = 222\ watts$$

2) $$T_c = \emptyset_c/\omega$$

$$T_c = \frac{2\pi}{3}/2\pi 50 = 6.67\text{msec}$$

Q4]3-Phase half-wave rectifier with delta-star transformer and (250w,5A) resistive load. Find the value of the secondary line voltage.

Ans.

$$P_{dc} = V_{dc} \times I_{dc}$$

$$V_{dc} = \frac{250}{5} = 50v$$

$$V_{dc} = \frac{3\sqrt{3}V_m}{2\pi}$$

$$50 = \frac{3\sqrt{3}\times V_m}{2\pi} \rightarrow V_m = 60.5v$$

$$V_{rms,Line} = V_{max,phase} \times \frac{\sqrt{3}}{\sqrt{2}}$$

$$V_{rms,Line} = 60 \times \frac{\sqrt{3}}{\sqrt{2}} = 74 \text{ volt}$$

Q5]3-Phase bridge rectifier with delta-star transformer is connected to 10 Ω resistive load. For 220 V secondary line to line voltage and 50 Hz. Calculate

1- The dc load power 2- the conduction time of each diode.

Ans.

1) $P = \frac{{V_{dc}}^2}{R}$ (1)

$V_{dc} = \frac{3V_m}{\pi}$ (2)

$V_m = \sqrt{2} \times 220$ (3)

Sub. eq(3) in eq(2)

$V_{dc} = \frac{3\times\sqrt{2}\times220}{\pi} = 297\ volt$

$P = \frac{{V_{dc}}^2}{R} = \frac{297^2}{100} = 883\ watts$

2) $T_c = \emptyset_c/\omega$

$T_c = \frac{\pi}{3}/2\pi50 = 3.33\text{msec}$

Q6]3-Phase bridge rectifier with delta-star transformer and (250w,5A) resistive load. Find the value of the secondary line voltage.

Ans.

$P_{dc} = V_{dc} \times I_{dc}$

$V_{dc} = \frac{250}{5} = 50v$

$V_{dc} = \frac{3V_m}{\pi}$

$50 = \frac{3\times V_m}{\pi} \rightarrow V_m = 52.33v$

$V_{rms,Line} = V_{max,phase} \times \frac{1}{\sqrt{2}}$

$V_{rms,Line} = 52.33 \times \frac{1}{\sqrt{2}} = 37\ \text{volt}$

Q7]3-Phase Bridge rectifier with delta-star transformer and (2500w,25ohm) resistive load. Find the value of the secondary line voltage.

$P = \frac{{V_{dc}}^2}{R}$, ${V_{dc}}^2 = P \times R$,

${V_{dc}}^2 = 2500 \times 25$

${V_{dc}}^2 = 625000$, $V_{dc} = 250\text{v}$

$V_{dc} = \frac{3V_m}{\pi}$, $250 = \frac{3V_m}{\pi}$, $V_m = 261.67$

$V_{line} = \frac{V_m}{\sqrt{2}}$, $V_{line} = \frac{261.67}{\sqrt{2}} = 185\text{v}$

Q8]3-Phase Bridge rectifier with $\Delta - Y$ transformer have DC Power of 500W and 5Ω resistive load. Plot circuit diagram, then Find the value of the secondary line voltage.

$P = \frac{{V_{dc}}^2}{R}$, ${V_{dc}}^2 = P \times R$,

${V_{dc}}^2 = 500 \times 5$

${V_{dc}}^2 = 2500$, $V_{dc} = 50\ volt$

$V_{dc} = \frac{3V_m}{\pi}$, $50 = \frac{3V_m}{\pi}$, $V_m = 52.33$

$V_{line} = \frac{V_m}{\sqrt{2}}$, $V_{line} = \frac{52.33}{\sqrt{2}} = 37\text{v}$

Q9]3-Phase half wave rectifier with $\Delta - Y$ transformer and (250w,10Ω) resistive load. Plot circuit diagram, then Find the value of the secondary line voltage.

$P = \frac{{V_{dc}}^2}{R}$, ${V_{dc}}^2 = P \times R$,

${V_{dc}}^2 = 250 \times 10$

${V_{dc}}^2 = 2500$, $V_{dc} = 50\ volt$

$V_{dc} = \frac{3\sqrt{3}V_m}{2\pi}$, $50 = \frac{3\sqrt{3}V_m}{2\pi}$, $V_m = 60.5\ volt$

$V_{phase} = \frac{V_m}{\sqrt{2}}$, $V_{phase} = \frac{60.5}{\sqrt{2}} = 42.79\ volt$

$V_{line} = \sqrt{3} \times V_{phase} = 1.73 \times 42.79 = 74\ volt$