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Exercise – 6.2

Use **MATLAB (Simulink)** to

i. simulate a three-phase controlled full wave rectifier supplying an R-L-E load for a given firing angle

Use **MATLAB Code** to

ii. plot the variation of output voltage with respect to firing angle variation

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Initial Calculations:

To construct the **6-pulse generator**:

- Phase delay (secs) in firing the thyristors of a three phase rectifier:

  T_1 → (30+alpha)*10e-3/180

  T_2 → (90+alpha)*10e-3/180

  T_3 → (150+alpha)*10e-3/180

  T_4 → (210+alpha)*10e-3/180

  T_5 → (270+alpha)*10e-3/180

  T_6 → (330+alpha)*10e-3/180

- Time period of pulses = 20 ms
- Pulse width (% of period) = 2 %

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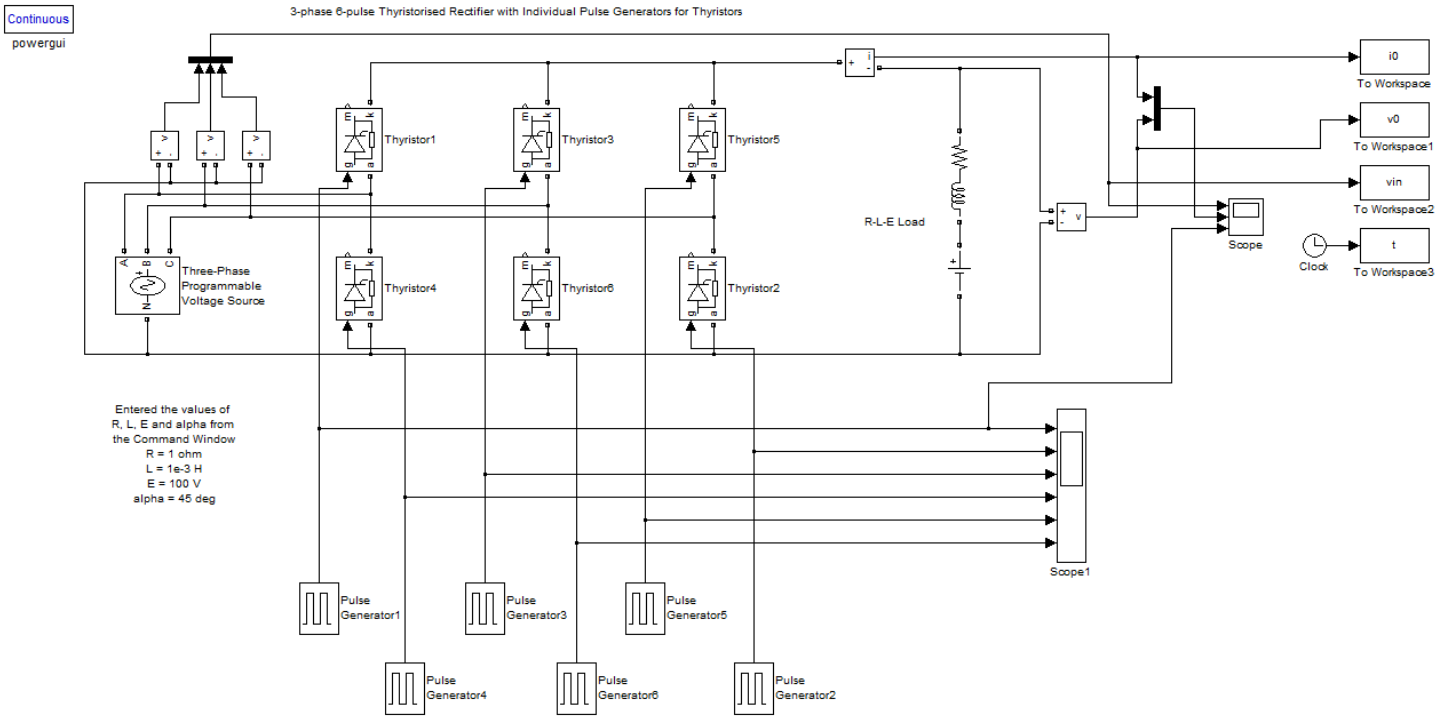
Simulink Circuit:

i. Three-phase controlled full wave rectifier



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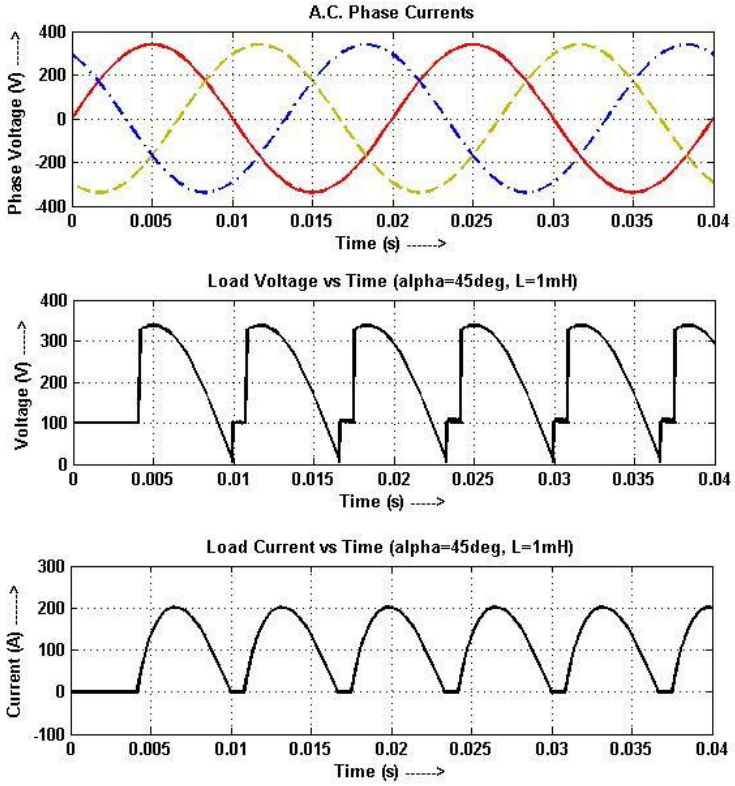
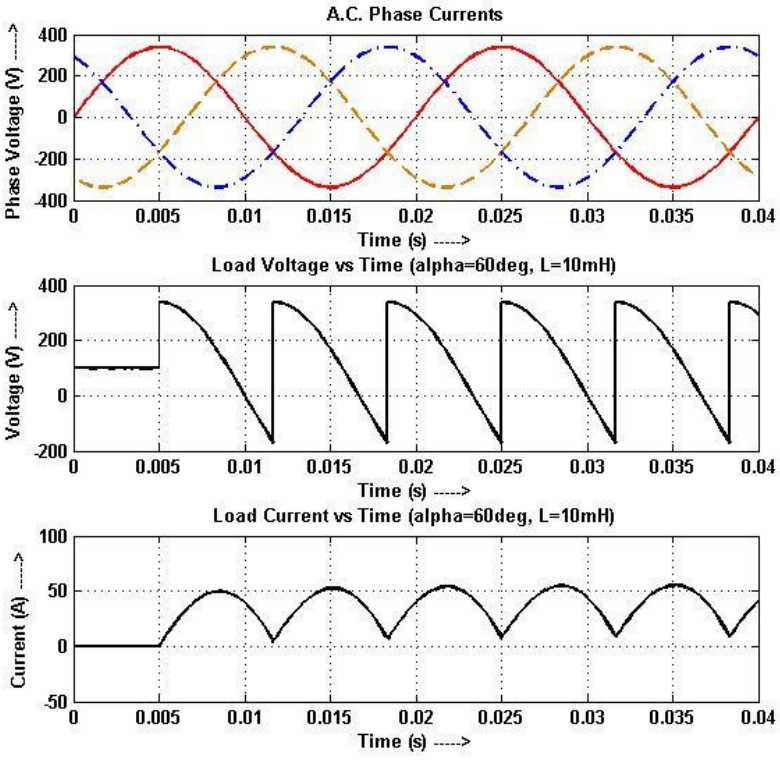
Waveforms:

1. Discontinuous Conduction Mode (alpha=45°, L=1 mH)



2. Continuous Conduction Mode (alpha=60°, L=10 mH)



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Formulae:

$$V_0 = \frac{3\sqrt{3}V_m}{\pi}\cos(\alpha)$$

m-code:

```
% Ex-6.2 (Power Electronics)
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clc;
clear all;
close all;

V = input('Enter the rms phase voltage: ');
Vm = V*sqrt(2);
alpha=0:0.01:180;
Vo=3*sqrt(3)*Vm/pi*cosd(alpha);
plot(alpha,Vo)
grid on
xlabel('Firing Angle (deg) ------>');
ylabel('Output Voltage (V) ------>');
title('Output voltage vs firing angle');
```
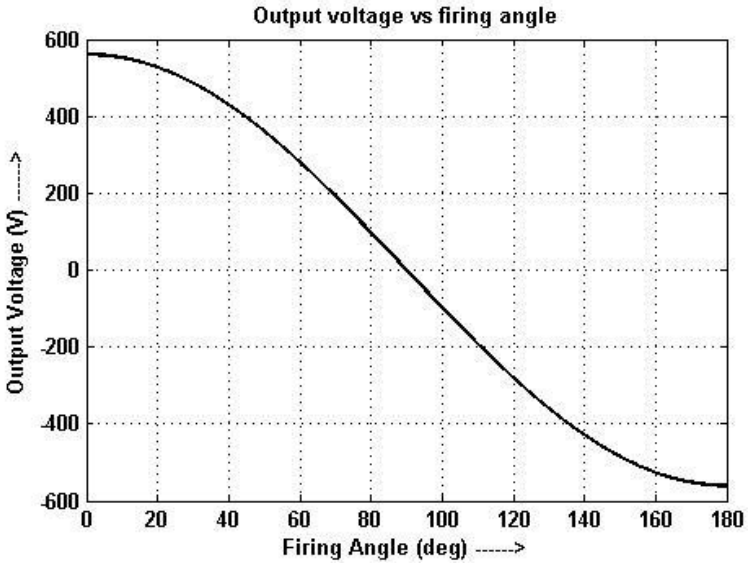

Plot:

(Phase Voltage rms, V=239.6 V)



Results:

Hence the circuit of a three-phase controlled full wave rectifier supplying an R-L-E load is simulated using MATLAB-Simulink and the necessary waveforms are plotted for particular firing angles. Also, the variation of output voltage with varying firing angles is plotted with the help of MATLAB-Code.