BLDC Motor Equations.

$$V_{ab} = R(i_a - i_b) + L\frac{d}{dt}(i_a - i_b) + e_a - e_b$$

$$V_{bc} = R(i_b - i_c) + L\frac{d}{dt}(i_b - i_c) + e_b - e_c$$

$$V_{ca} = R(i_c - i_a) + L\frac{d}{dt}(i_c - i_a) + e_c - e_a$$

$$T_e = K_f \omega_m + J\frac{d\omega_m}{dt} + T_L$$

where,

$$e_a = \frac{K_e}{2}\omega_m F(\theta_e)$$

$$e_b = \frac{K_e}{2}\omega_m F\left(\theta_e - \frac{2\pi}{3}\right)$$

$$e_c = \frac{K_e}{2}\omega_m F\left(\theta_e - \frac{4\pi}{3}\right).$$

$$F(\theta_e) = \begin{cases} 1, & 0 \le \theta_e < \frac{2\pi}{3} \\ 1 - \frac{6}{\pi}\left(\theta_e - \frac{2\pi}{3}\right), & \frac{2\pi}{3} \le \theta_e < \pi \\ -1, & \pi \le \theta_e < \frac{5}{3}\pi \\ -1 + \frac{6}{\pi}\left(\theta_e - \frac{5\pi}{3}\right), & \frac{5\pi}{3} \le \theta_e < 2\pi. \end{cases}$$