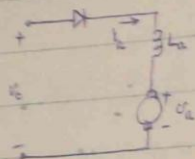


## Chapter 4

### SINGLE-PHASE DRIVES

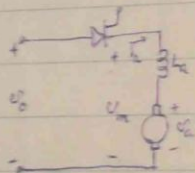
#### 4-1 Half wave drives



Half wave diode drive

$$T_m = -\frac{\partial}{\partial \theta} \left[ \frac{1}{2} J \left( \frac{d\theta}{dt} \right)^2 \right]$$

$$= -J \frac{d^2 \theta}{dt^2}$$



Half wave thyristor drive

$$v_o = i_a R_a + L \frac{di_a}{dt} + e_a$$

$$v_o dt = R_a i_a dt + L di_a + e_a dt$$

$$\int_{\alpha/\omega}^{\beta/\omega} v_o dt = R_a \int_{\alpha/\omega}^{\beta/\omega} i_a dt + L \int_{i_a} di_a + \int_{\alpha/\omega}^{\beta/\omega} e_a dt$$

$$V_m' = R_a I_a' + V_a' = R_a I_a' + K_a \phi_f N'$$

$$T_m = K_f \phi_f i_a = T_i + J \frac{d\omega_m}{dt}$$

$$K_f \phi_f \int_0^{2\pi/\omega} i_a dt = \int_0^{2\pi/\omega} T_i dt + J \int_{\omega_m} d\omega_m$$

$$K_f \phi_f I_a = T_i$$

#### 4-2 Full wave drives

$$v_o = v_a + i_a R_a + L_a \frac{di_a}{dt} \quad \alpha < \omega t < \pi$$

$$0 = v_a + i_a R_a + L_a \frac{di_a}{dt} \quad \pi < \omega t < \alpha + \pi$$

$$V_m = V_a + I_a R_a$$

$$V_m = 0.45 V_o (1 + \cos \alpha) = \text{average voltage applied to motor}$$

$$V_a = K_a \phi_f N = \text{average armature generated voltage}$$

$$I_a = \frac{T}{K_f \phi_f} = \text{average armature current}$$

$$N = \frac{0.45 n_o (1 + \cos \alpha) - \frac{R_a}{K_f \phi_f} T}{K_a \phi_f}$$