ENERGY CONVERSION FORMULA SHIT

1. DC MACHINES

EFFICIENCY

- ✓ $Efficiency = \frac{Pout}{Pin} \times 100\%$
- ✓ $Efficiency = \frac{Pin - Ploss}{Pin} \times 100\%$

ELECTRICAL OR COPPER LOSSES

- ✓ $Armature\ Loss = P_A = {I_A}^2 \times R_A$
- ✓ $Field\ Loss = P_F = {I_F}^2 \times R_F$

BRUSH LOSSES

- ✓ $Brush\ Loss = P_{BD} = V_{BD} \times I_A$

POWER FLOW

- ✓ $Electrical\ Power\ Converted = P_{conv} = E_A \times I_A$
- ✓ $Mechanical\ Power\ Converted = P_{conv} = \tau_{ind} \times \omega_m$

TORQUE AND VOLTAGE

- ✓ $Internal\ Generated\ Voltage = E_A = K\phi\omega$
- ✓ $Induced\ Torque = \tau_{ind} = K\phi I_A$

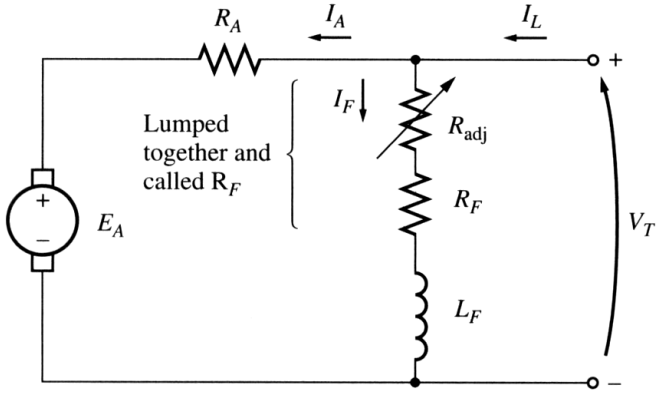
SEPERATELY EXCITED AND SHUNT DC MOTORS

- ✓ $Terminal\ Voltage = V_T = E_A + I_A R_A$

SPEED AND VOLTAGE

✓ $\frac{Speed\ with\ Load\ 1}{Speed\ with\ Load\ 2} = \frac{n_1}{n_2} = \frac{E_{A1}}{E_{A2}}$

DC SHUNT MOTOR EQUIVALENT CIRCUIT

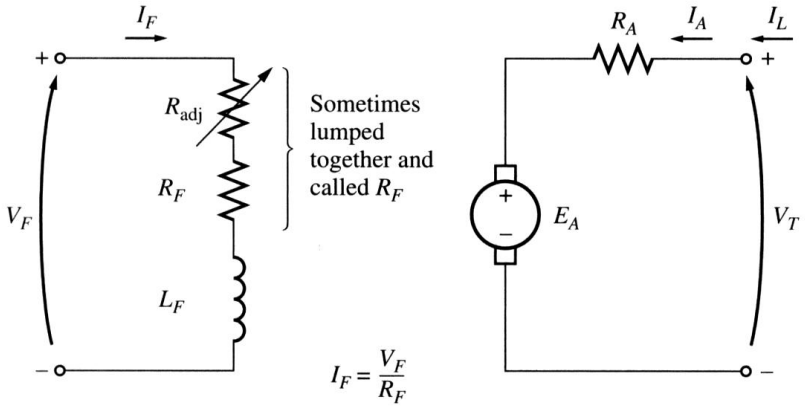


$$I_F = \frac{V_T}{R_F}$$

$$V_T = E_A + I_A R_A$$

$$I_L = I_A + I_F$$

DC SEPERATELY EXCITED MOTOR EQUIVALENT CIRCUIT

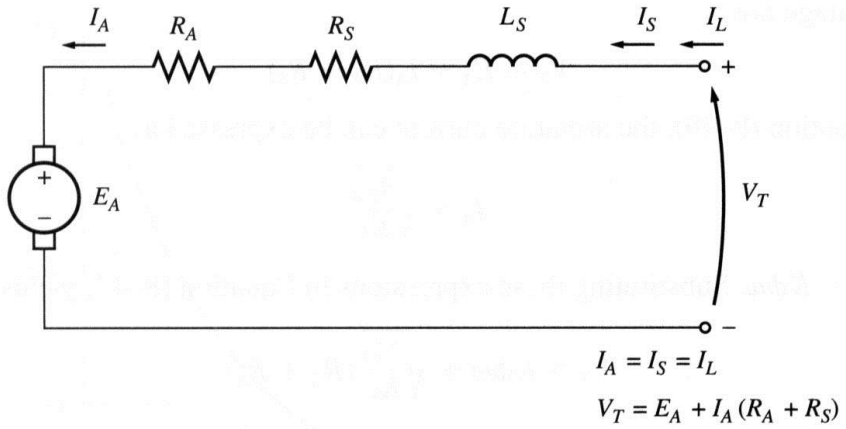


$$I_F = \frac{V_F}{R_F}$$

$$V_T = E_A + I_A R_A$$

$$I_L = I_A$$

DC SERIES MOTOR EQUIVALENT CIRCUIT

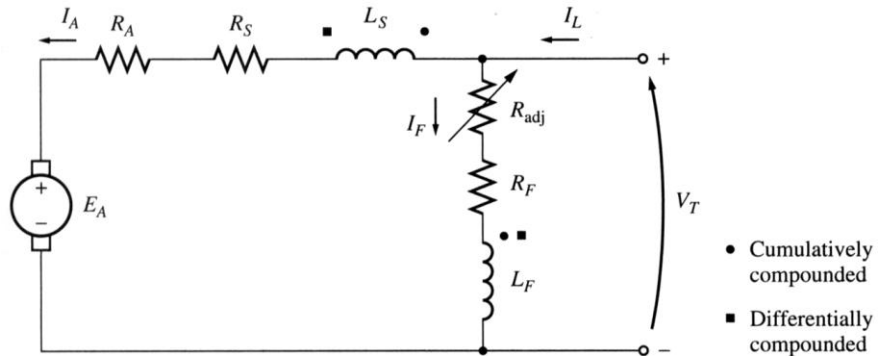


DC SERIES MOTOR TORQUE

✓ $Induced\ Torque = \tau_{ind} = KcI_A{}^2$

Where c is proportionality constant

DC COMPOUND MOTOR EQUIVALENT CIRCUIT



2. INDUCTION MOTORS

SPEED

$$Slip\ Speed = n_{slip} = n_{sync} - n_m$$

SLIP

✓ $Slip = s = \frac{n_{sync} - n_m}{n_{sync}}$

FREQUENCY

✓ $Rotor\ Frequency = f_r = \frac{No.of\ Stator\ Poles \times Slip\ Speed}{120} = \frac{P \times n}{120}$

✓ $New\ Frequency = f_r = sf_e$

TORQUE AND POWER

✓ $Torque\ of\ the\ Load = \tau_{load} = \frac{P_{out}}{\omega_m}$

✓ $\omega_m = \frac{2\Pi n_m}{60}\ rad/s$

HORSE POWER

✓ $Horse\ Power = hp = 746\ Watts$

EQUIVALENT CIRCUIT