

Important DC Shunt Generator Formulas PDF



Formulas Examples with Units

List of 16 Important DC Shunt Generator Formulas

1) Current Formulas

1.1) Armature Current for DC Shunt Generator Formula

Formula

$$I_a = I_{sh} + I_L$$

Example with Units

$$1.7\text{ A} = 0.75\text{ A} + 0.95\text{ A}$$

Evaluate Formula 

1.2) Field Current of DC Shunt Generator Formula

Formula

$$I_{sh} = \frac{V_t}{R_{sh}}$$

Example with Units

$$0.7568\text{ A} = \frac{140\text{ V}}{185\ \Omega}$$

Evaluate Formula 

1.3) Field Current of DC Shunt Generator given Load Current Formula

Formula

$$I_{sh} = I_a - I_L$$

Example with Units

$$0.75\text{ A} = 1.7\text{ A} - 0.95\text{ A}$$

Evaluate Formula 

2) Efficiency Formulas

2.1) Electrical Efficiency of DC Shunt Generator Formula

Formula

$$\eta_e = \frac{P_o}{P_{conv}}$$

Example with Units

$$0.9333 = \frac{238\text{ W}}{255\text{ W}}$$

Evaluate Formula 

2.2) Overall Efficiency in DC Shunt Generator Formula

Formula

$$\eta_o = \frac{P_o}{P_{in}}$$

Example with Units

$$0.476 = \frac{238\text{ W}}{500\text{ W}}$$

Evaluate Formula 



3) Losses Formulas

3.1) Armature Copper Loss for DC Shunt Generator Formula

Formula

$$P_{cu} = I_a^2 \cdot R_a$$

Example with Units

$$101.8725 \text{ W} = 1.7 \text{ A}^2 \cdot 35.25 \Omega$$

Evaluate Formula 

3.2) Core Losses of DC Shunt Generator given Converted Power Formula

Formula

$$P_{core} = P_{in} - P_m - P_{conv} - P_{stray}$$

Example with Units

$$112.5 \text{ W} = 500 \text{ W} - 12 \text{ W} - 255 \text{ W} - 120.5 \text{ W}$$

Evaluate Formula 

3.3) Shunt Field Copper Loss for DC Shunt Generator Formula

Formula

$$P_{cu} = I_{sh}^2 \cdot R_{sh}$$

Example with Units

$$104.0625 \text{ W} = 0.75 \text{ A}^2 \cdot 185 \Omega$$

Evaluate Formula 

3.4) Stray Losses of DC Shunt Generator given Converted Power Formula

Formula

$$P_{stray} = P_{in} - P_m - P_{core} - P_{conv}$$

Example with Units

$$120.5 \text{ W} = 500 \text{ W} - 12 \text{ W} - 112.5 \text{ W} - 255 \text{ W}$$

Evaluate Formula 

4) Mechanical Specifications Formulas

4.1) Back Pitch for DC Shunt Generator Formula

Formula

$$Y_B = \left(\frac{2 \cdot S}{P} \right) + 1$$

Example

$$51 = \left(\frac{2 \cdot 100}{4} \right) + 1$$

Evaluate Formula 

4.2) Commutator Pitch for DC Shunt Generator Formula

Formula

$$Y_C = \frac{Y_B + Y_F}{2}$$

Example

$$50 = \frac{51 + 49}{2}$$

Evaluate Formula 

4.3) Front Pitch for DC Shunt Generator Formula

Formula

$$Y_F = \left(\frac{2 \cdot S}{P} \right) - 1$$

Example

$$49 = \left(\frac{2 \cdot 100}{4} \right) - 1$$

Evaluate Formula 



5) Power Formulas

5.1) Converted Power of DC Shunt Generator Formula

Formula

$$P_{\text{conv}} = \frac{P_o}{\eta_e}$$

Example with Units

$$255.914 \text{ W} = \frac{238 \text{ W}}{0.93}$$

Evaluate Formula 

5.2) Power Generated given Armature Current in DC Shunt Generator Formula

Formula

$$P_o = V_t \cdot I_a$$

Example with Units

$$238 \text{ W} = 140 \text{ V} \cdot 1.7 \text{ A}$$

Evaluate Formula 

6) Voltage & EMF Formulas

6.1) Back EMF for DC Shunt Generator Formula

Formula

$$E_b = K_f \cdot \Phi \cdot \omega_s$$

Example with Units

$$11.3097 \text{ V} = 2 \cdot 0.2 \text{ Wb} \cdot 270 \text{ rev/min}$$

Evaluate Formula 

6.2) Terminal Voltage for DC Shunt Generator Formula

Formula

$$V_t = V_a - I_a \cdot R_a$$

Example with Units

$$140.075 \text{ V} = 200 \text{ V} - 1.7 \text{ A} \cdot 35.25 \Omega$$

Evaluate Formula 



Variables used in list of DC Shunt Generator Formulas above

- E_b Back EMF (Volt)
- I_a Armature Current (Ampere)
- I_L Load Current (Ampere)
- I_{sh} Shunt Field Current (Ampere)
- K_f Machine Constant
- P Number of Poles
- P_{conv} Converted Power (Watt)
- P_{core} Core Loss (Watt)
- P_{cu} Copper Loss (Watt)
- P_{in} Input Power (Watt)
- P_m Mechanical Losses (Watt)
- P_o Output Power (Watt)
- P_{stray} Stray Loss (Watt)
- R_a Armature Resistance (Ohm)
- R_{sh} Shunt Field Resistance (Ohm)
- S Number of Slots
- V_a Armature Voltage (Volt)
- V_t Terminal Voltage (Volt)
- Y_B Back Pitch
- Y_C Commutator Pitch
- Y_F Front Pitch
- η_e Electrical Efficiency
- η_o Overall Efficiency
- Φ Magnetic Flux (Weber)
- ω_s Angular Speed (Revolution per Minute)

Constants, Functions, Measurements used in list of DC Shunt Generator Formulas above

- **Measurement: Electric Current** in Ampere (A)
[Electric Current Unit Conversion](#) ↻
- **Measurement: Power** in Watt (W)
[Power Unit Conversion](#) ↻
- **Measurement: Magnetic Flux** in Weber (Wb)
[Magnetic Flux Unit Conversion](#) ↻
- **Measurement: Electric Resistance** in Ohm (Ω)
[Electric Resistance Unit Conversion](#) ↻
- **Measurement: Electric Potential** in Volt (V)
[Electric Potential Unit Conversion](#) ↻
- **Measurement: Angular Velocity** in Revolution per Minute (rev/min)
[Angular Velocity Unit Conversion](#) ↻



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- **Important DC Series Generator Formulas** 
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