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DC Shunt Generator Formulas

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List of 16 DC Shunt Generator Formulas

DC Shunt Generator

Current

1) Armature Current for DC Shunt Generator

Open Calculator

fx $I_a = I_{sh} + I_L$

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

2) Field Current of DC Shunt Generator

Open Calculator

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

ex $0.756757\text{A} = \frac{140\text{V}}{185\Omega}$

3) Field Current of DC Shunt Generator given Load Current

Open Calculator

fx $I_{sh} = I_a - I_L$

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

Efficiency

4) Electrical Efficiency of DC Shunt Generator

Open Calculator

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

ex $$0.933333 = \frac{238W}{255W}$$

5) Overall Efficiency in DC Shunt Generator

Open Calculator

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

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

Losses

6) Armature Copper Loss for DC Shunt Generator

Open Calculator

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

ex $$101.8725W = (1.7A)^2 \cdot 35.25\Omega$$

7) Core Losses of DC Shunt Generator given Converted Power

Open Calculator

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

ex $$112.5W = 500W - 12W - 255W - 120.5W$$

8) Shunt Field Copper Loss for DC Shunt Generator

Open Calculator

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

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

9) Stray Losses of DC Shunt Generator given Converted Power

Open Calculator

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

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

Mechanical Specifications

10) Back Pitch for DC Shunt Generator

Open Calculator

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

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

11) Commutator Pitch for DC Shunt Generator

Open Calculator

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

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

12) Front Pitch for DC Shunt Generator

Open Calculator

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

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

Power

13) Converted Power of DC Shunt Generator

Open Calculator

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

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

14) Power Generated given Armature Current in DC Shunt Generator

Open Calculator

fx $$P_o = V_t \cdot I_a$$

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

Voltage & EMF

15) Back EMF for DC Shunt Generator

Open Calculator

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

ex $$11.30973\text{V} = 2 \cdot 0.2\text{Wb} \cdot 270\text{r/ min}$$

16) Terminal Voltage for DC Shunt Generator

Open Calculator

fx $V_t = V_a - I_a \cdot R_a$

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

Variables Used

- 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

- 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 (r/min)
  Angular Velocity Unit Conversion

Check other formula lists

- DC Generator Characteristics Formulas
- DC Series Generator Formulas
- DC Shunt Generator Formulas

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