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DC Series Generator Formulas

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List of 18 DC Series Generator Formulas

DC Series Generator

Current

1) Armature Current of Series DC Generator given Output Power

Open Calculator

fx $$I_a = \sqrt{\frac{P_{conv} - P_{out}}{R_a}}$$

ex $$0.660029A = \sqrt{\frac{165.5W - 150W}{35.58\Omega}}$$

2) Armature Current of Series DC Generator given Torque

Open Calculator

fx $$I_a = \frac{\tau \cdot \omega_s}{V_a}$$

ex $$0.656545A = \frac{1.57N*m \cdot 115rad/s}{275V}$$

3) Armature Current of Series DC Generator using Terminal Voltage

Open Calculator

fx $$I_a = \frac{V_a - V_t}{R_{se} + R_a}$$

ex $$0.660045A = \frac{275V - 170V}{123.5\Omega + 35.58\Omega}$$

4) Load Current of Series DC Generator given Load Power

Open Calculator

fx $$I_L = \frac{P_L}{V_t}$$

ex $$0.885294\text{A} = \frac{150.5\text{W}}{170\text{V}}$$

5) Load Current of Series DC Generator given Output Power

Open Calculator

fx $$I_L = \frac{P_{out}}{V_t}$$

ex $$0.882353\text{A} = \frac{150\text{W}}{170\text{V}}$$

Losses

6) Mechanical Losses of Series DC Generator given Converted Power

Open Calculator

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

ex $$9\text{W} = 180\text{W} - 2.8\text{W} - 2.7\text{W} - 165.5\text{W}$$

7) Series Field Copper Loss in DC Generator

Open Calculator

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

ex $$85.48966\text{W} = (0.832\text{A})^2 \cdot 123.5\Omega$$

Mechanical Specifications

8) Angular Speed of Series DC Generator given Torque

Open Calculator

fx $$\omega_s = \frac{P_{in}}{\tau}$$

ex $$114.6497\text{rad/s} = \frac{180\text{W}}{1.57\text{N*m}}$$

9) Resultant Pitch of DC Series Generator

Open Calculator

fx $$Y_R = Y_B + Y_F$$

ex $$100 = 51 + 49$$

10) Torque of Series DC Generator given Angular Speed and Armature Current

Open Calculator

fx $$\tau = \frac{V_a \cdot I_a}{\omega_s}$$

ex $$1.578261\text{N*m} = \frac{275\text{V} \cdot 0.66\text{A}}{115\text{rad/s}}$$

Power

11) Converted Power of Series DC Generator given Input Power

Open Calculator

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

ex $$165.5\text{W} = 180\text{W} - 2.7\text{W} - 9\text{W} - 2.8\text{W}$$

12) Converted Power of Series DC Generator given Output Power

Open Calculator

fx $$P_{conv} = P_{out} + I_{a}^2 \cdot R_{a}$$

ex $$165.4986\text{W} = 150\text{W} + (0.66\text{A})^2 \cdot 35.58\Omega$$

Resistance

13) Armature Resistance of Series DC Generator given Output Power

Open Calculator

fx $$R_{a} = \frac{P_{conv} - P_{out}}{I_{a}^2}$$

ex $$35.5831\Omega = \frac{165.5\text{W} - 150\text{W}}{(0.66\text{A})^2}$$

14) Armature Resistance of Series DC Generator using Terminal Voltage

Open Calculator

fx $$R_a = \left(\frac{V_a - V_t}{I_a}\right) - R_{se}$$

ex $$35.59091\Omega = \left(\frac{275V - 170V}{0.66A}\right) - 123.5\Omega$$

15) Series Field Resistance of Series DC Generator using Terminal Voltage

Open Calculator

fx $$R_{se} = \left(\frac{V_a - V_t}{I_a}\right) - R_a$$

ex $$123.5109\Omega = \left(\frac{275V - 170V}{0.66A}\right) - 35.58\Omega$$

Voltage & EMF

16) Armature Induced Voltage of Series DC Generator

Open Calculator

fx $$V_a = V_t + I_a \cdot (R_a + R_{se})$$

ex $$274.9928V = 170V + 0.66A \cdot (35.58\Omega + 123.5\Omega)$$

17) Terminal Voltage of Series DC Generator

Open Calculator

fx $$V_t = V_a - I_a \cdot (R_a + R_{se})$$

ex $$170.0072V = 275V - 0.66A \cdot (35.58\Omega + 123.5\Omega)$$

18) Terminal Voltage of Series DC Generator given Output Power

Open Calculator

fx $$V_t = \frac{P_{out}}{I_L}$$

ex $$170.4545\text{V} = \frac{150\text{W}}{0.88\text{A}}$$

Variables Used

- I_a Armature Current *(Ampere)*
- I_L Load Current *(Ampere)*
- I_{se} Series Field Current *(Ampere)*
- P_{conv} Converted Power *(Watt)*
- P_{core} Core Loss *(Watt)*
- P_{in} Input Power *(Watt)*
- P_L Load Power *(Watt)*
- P_m Mechanical Losses *(Watt)*
- P_{out} Output Power *(Watt)*
- P_{se} Series Field Loss *(Watt)*
- P_{stray} Stray Loss *(Watt)*
- R_a Armature Resistance *(Ohm)*
- R_{se} Series Field Resistance *(Ohm)*
- V_a Armature Voltage *(Volt)*
- V_t Terminal Voltage *(Volt)*
- Y_B Back Pitch
- Y_F Front Pitch
- Y_R Resultant Pitch
- τ Torque *(Newton Meter)*
- ω_s Angular Speed *(Radian per Second)*

Constants, Functions, Measurements used

- Function: **sqrt**, sqrt(Number)
  Square root function
- Measurement: **Electric Current** in Ampere (A)
  Electric Current Unit Conversion
- Measurement: **Power** in Watt (W)
  Power 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 Radian per Second (rad/s)
  Angular Velocity Unit Conversion
- Measurement: **Torque** in Newton Meter (N*m)
  Torque Unit Conversion

Check other formula lists

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

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