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DC Generator Characteristics Formulas

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List of 17 DC Generator Characteristics Formulas

DC Generator Characteristics

1) Armature Current of DC Generator given Power

Open Calculator

fx $$I_a = \frac{P_{conv}}{V_a}$$

ex $$0.7525A = \frac{150.5W}{200V}$$

2) Armature Power in DC Generator

Open Calculator

fx $$P_a = V_a \cdot I_a$$

ex $$150W = 200V \cdot 0.75A$$

3) Armature Resistance of DC Generator using Output Voltage

Open Calculator

fx $$R_a = \frac{V_a - V_o}{I_a}$$

ex $$80\Omega = \frac{200V - 140V}{0.75A}$$

4) Back EMF of DC Generator given Flux

Open Calculator

$$E = K_e \cdot \omega_s \cdot \Phi_p$$

$$14.3184\text{V} = 0.76 \cdot 314\text{rad/s} \cdot 0.06\text{Wb}$$

5) Converted Power in DC Generator

Open Calculator

$$P_{conv} = V_o \cdot I_L$$

$$150.5\text{W} = 140\text{V} \cdot 1.075\text{A}$$

6) Core Losses of DC Generator given Converted Power

Open Calculator

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

$$17\text{W} = 220\text{W} - 9.1\text{W} - 150.5\text{W} - 43.4\text{W}$$

7) Electrical Efficiency of DC Generator

Open Calculator

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

$$0.797342 = \frac{120\text{W}}{150.5\text{W}}$$

8) EMF for DC Generator for Wave Winding

Open Calculator

$$E = \frac{P \cdot N_r \cdot \Phi_p \cdot Z}{120}$$

$$14.32566\text{V} = \frac{19 \cdot 1200\text{rev/min} \cdot 0.06\text{Wb} \cdot 12}{120}$$

9) EMF for DC Generator with Lap Winding

Open Calculator

fx $$E = \frac{N_r \cdot \Phi_p \cdot Z}{60}$$

ex $$14.4V = \frac{1200rev/min \cdot 0.06Wb \cdot 12}{60}$$

10) Field Copper Loss in DC Generator

Open Calculator

fx $$P_{cu} = I_f^2 \cdot R_f$$

ex $$4.5125W = (0.95A)^2 \cdot 5\Omega$$

11) Induced Armature Voltage of DC Generator given Converted Power

Open Calculator

fx $$V_a = \frac{P_{conv}}{I_a}$$

ex $$200.6667V = \frac{150.5W}{0.75A}$$

12) Mechanical Efficiency of DC Generator using Armature Voltage

Open Calculator

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

ex $$0.682439 = \frac{200V \cdot 0.75A}{314rad/s \cdot 0.7N*m}$$

13) Mechanical Efficiency of DC Generator using Converted Power

Open Calculator

fx $$\eta_m = \frac{P_{conv}}{P_{in}}$$

ex $$0.684091 = \frac{150.5W}{220W}$$

14) Output Voltage in DC Generator using Converted Power

Open Calculator

fx $$V_o = \frac{P_{conv}}{I_L}$$

ex $$140V = \frac{150.5W}{1.075A}$$

15) Overall Efficiency of DC Generator

Open Calculator

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

ex $$0.545455 = \frac{120W}{220W}$$

16) Power Drop in Brush DC Generator

Open Calculator

fx $$P_{BD} = I_a \cdot V_{BD}$$

ex $$4.3875W = 0.75A \cdot 5.85V$$

17) Stray Losses of DC Generator given Converted Power

Open Calculator

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

ex $$43.4W = 220W - 9.1W - 17W - 150.5W$$

Variables Used

- **E** EMF *(Volt)*
- I_a Armature Current *(Ampere)*
- I_f Field Current *(Ampere)*
- I_L Load Current *(Ampere)*
- K_e Back EMF Constant
- N_r Rotor Speed *(Revolution per Minute)*
- **P** Number of Poles
- P_a Amature Power *(Watt)*
- P_{BD} Brush Power Drop *(Watt)*
- 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_f Field Resistance *(Ohm)*
- V_a Armature Voltage *(Volt)*
- V_{BD} Brush Voltage Drop *(Volt)*
- V_o Output Voltage *(Volt)*

- Z Number of Conductor
- η_e Electrical Efficiency
- η_m Mechanical Efficiency
- η_o Overall Efficiency
- τ Torque *(Newton Meter)*
- Φ_p Flux per Pole *(Weber)*
- ω_s Angular Speed *(Radian per Second)*

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 Radian per Second (rad/s), Revolution per Minute (rev/min)
  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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