Important DC Generator Characteristics Formulas PDF

Formulas
Examples
with Units

List of 17
Important DC Generator Characteristics Formulas

1) Armature Current of DC Generator given Power Formula

Evaluate Formula

Formula

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

Example with Units

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

2) Armature Power in DC Generator Formula

Evaluate Formula

Formula

$$P_a = V_a \cdot I_a$$

Example with Units

$$150\,\text{W} = 200\,\text{V} \cdot 0.75\,\text{A}$$

3) Armature Resistance of DC Generator using Output Voltage Formula

Evaluate Formula

Formula

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

Example with Units

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

4) Back EMF of DC Generator given Flux Formula

Evaluate Formula

Formula

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

Example with Units

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

5) Converted Power in DC Generator Formula

Evaluate Formula

Formula

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

Example with Units

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

6) Core Losses of DC Generator given Converted Power Formula

Evaluate Formula

Formula

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

Example with Units

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

7) Electrical Efficiency of DC Generator Formula

Evaluate Formula

Formula

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

Example with Units

$$0.7973 = \frac{120\,\text{W}}{150.5\,\text{W}}$$

8) EMF for DC Generator for Wave Winding Formula

Evaluate Formula

Formula

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

Example with Units

$$14.3257\,\text{V} = \frac{19 \cdot 1200\,\text{rev/min} \cdot 0.06\,\text{Wb} \cdot 12}{120}$$

9) EMF for DC Generator with Lap Winding Formula

Evaluate Formula

Formula

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

Example with Units

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

10) Field Copper Loss in DC Generator Formula

Evaluate Formula

Formula

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

Example with Units

$$4.5125\,\text{W} = 0.95\,\text{A}^2 \cdot 5\,\Omega$$

11) Induced Armature Voltage of DC Generator given Converted Power Formula

Evaluate Formula

Formula

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

Example with Units

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

12) Mechanical Efficiency of DC Generator using Armature Voltage Formula

Evaluate Formula

Formula

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

Example with Units

$$0.6824 = \frac{200\,\text{V} \cdot 0.75\,\text{A}}{314\,\text{rad/s} \cdot 0.7\,\text{N*m}}$$

13) Mechanical Efficiency of DC Generator using Converted Power Formula

Evaluate Formula

Formula

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

Example with Units

$$0.6841 = \frac{150.5\,\text{W}}{220\,\text{W}}$$

14) Output Voltage in DC Generator using Converted Power Formula

Evaluate Formula

Formula

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

Example with Units

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

15) Overall Efficiency of DC Generator Formula

Evaluate Formula

Formula

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

Example with Units

$$0.5455 = \frac{120\,\text{W}}{220\,\text{W}}$$

16) Power Drop in Brush DC Generator Formula

Evaluate Formula

Formula

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

Example with Units

$$4.3875\,\text{W} = 0.75\,\text{A} \cdot 5.85\,\text{V}$$

17) Stray Losses of DC Generator given Converted Power Formula

Evaluate Formula

Formula

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

Example with Units

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

Variables used in list of DC Generator Characteristics Formulas above

- **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 in list of DC Generator Characteristics 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 Radian per Second (rad/s), Revolution per Minute (rev/min)
  Angular Velocity Unit Conversion
- Measurement: **Torque** in Newton Meter (N*m)
  Torque Unit Conversion

Download other Important DC Generator PDFs

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

Try our Unique Visual Calculators

- Percentage increase
- HCF calculator
- Mixed fraction

Please SHARE this PDF with someone who needs it!

This PDF can be downloaded in these languages

English Spanish French German Russian Italian Portuguese Polish Dutch

7/9/2024 | 4:13:14 AM UTC