Design of Flywheel Formulas...





# **Design of Flywheel Formulas**

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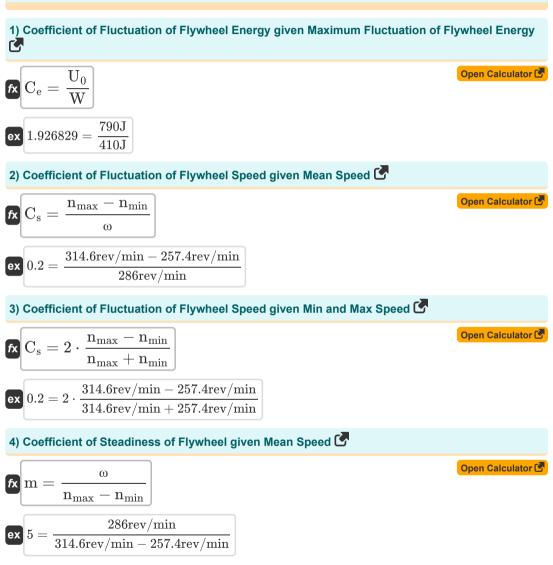
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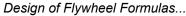


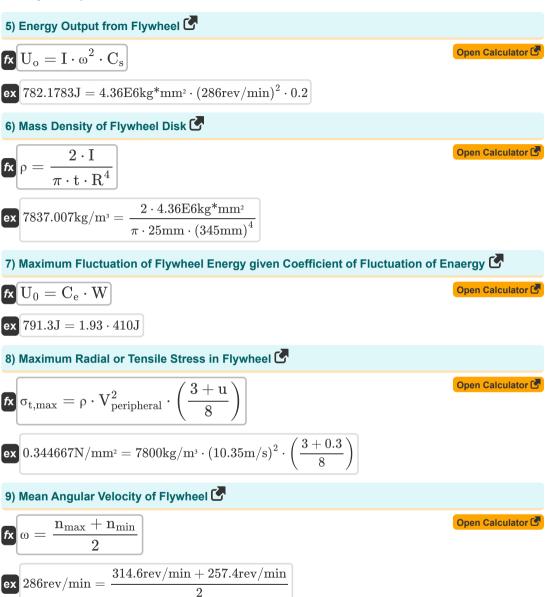
# List of 21 Design of Flywheel Formulas

# Design of Flywheel 🕑











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#### 10) Mean Torque of Flywheel for Four Stroke Engine

fx 
$$T_{\rm m} = rac{{
m W}}{4\cdot\pi}$$

 $ex 32626.76 \text{N*mm} = \frac{410 \text{J}}{4 \cdot \pi}$ 

#### 11) Mean Torque of Flywheel for Two Stroke Engine 🕑

$$\mathbf{T}_{\mathrm{m}} = rac{\mathrm{W}}{2\cdot\pi}$$

ex 65253.53N\*mm =  $\frac{410J}{2 \cdot \pi}$ 

## 12) Moment of Inertia of Flywheel

$$\mathbf{I} = rac{\mathrm{T}_1 - \mathrm{T}_2}{lpha}$$

$$4.3 \text{E}^{6} \text{kg}^{*} \text{mm}^{2} = \frac{20850 \text{N}^{*} \text{mm} - 13900 \text{N}^{*} \text{mm}}{1.6 \text{rad}/\text{s}^{2}}$$

#### 13) Moment of Inertia of Flywheel Disk 🕑

fx 
$$\mathrm{I}=rac{\pi}{2}\cdot
ho\cdot\mathrm{R}^{4}\cdot\mathrm{r}$$

ex 
$$4.3E^{6}kg^{*}mm^{2} = \frac{\pi}{2} \cdot 7800kg/m^{3} \cdot (345mm)^{4} \cdot 25mm$$

#### 14) Outer Radius of Flywheel Disk 🖸

$$\mathbf{\hat{k}} \mathbf{R} = \left(\frac{2 \cdot \mathbf{I}}{\pi \cdot \mathbf{t} \cdot \rho}\right)^{\frac{1}{4}}$$

$$\mathbf{ex} 345.4085 \text{mm} = \left(\frac{2 \cdot 4.36 \text{E6kg}^{*} \text{mm}^{2}}{\pi \cdot 25 \text{mm} \cdot 7800 \text{kg/m}^{3}}\right)^{\frac{1}{4}}$$



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## 15) Radial Stress in Rotating Flywheel at given Radius 🕑

fx 
$$\sigma_{
m r} = \rho \cdot V_{
m peripheral}^2 \cdot \left( rac{3+u}{8} 
ight) \cdot \left( 1 - \left( rac{r}{R} 
ight)^2 
ight)$$

$$\textbf{ex} \ 0.228837 \text{N/mm}^2 = 7800 \text{kg/m}^3 \cdot (10.35 \text{m/s})^2 \cdot \left(\frac{3+0.3}{8}\right) \cdot \left(1 - \left(\frac{200 \text{mm}}{345 \text{mm}}\right)^2\right)$$

16) Tangential Stress in Rotating Flywheel at given Radius 🕑

$$\boxed{\mathbf{fx}} \sigma_t = \rho \cdot V_{peripheral}^2 \cdot \frac{u+3}{8} \cdot \left(1 - \left(\frac{3 \cdot u + 1}{u+3}\right) \cdot \left(\frac{r}{R}\right)^2\right)$$

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$$0.277977 \mathrm{N/mm^2} = 7800 \mathrm{kg/m^3} \cdot (10.35 \mathrm{m/s})^2 \cdot rac{0.3+3}{8} \cdot \left(1 - \left(rac{3 \cdot 0.3+1}{0.3+3}
ight) \cdot \left(rac{200 \mathrm{mm}}{345 \mathrm{mm}}
ight)^2
ight)$$

#### 17) Tensile Stress in Spokes of Rimmed Flywheel 🕑

$$\begin{aligned} & \mathbf{\hat{\kappa}} \mathbf{\sigma} \mathbf{t}_{s} = \frac{\mathbf{P}}{\mathbf{b}_{rim} \cdot \mathbf{t}_{r}} + \frac{\mathbf{6} \cdot \mathbf{M}}{\mathbf{b}_{rim} \cdot \mathbf{t}_{r}^{2}} \\ & \mathbf{ex} \\ & \mathbf{25N/mm^{2}} = \frac{1500N}{15mm \cdot 16mm} + \frac{\mathbf{6} \cdot 12000N^{*}mm}{15mm \cdot (16mm)^{2}} \end{aligned}$$

## 18) Thickness of Flywheel Disk 🚰

$$fx t = \frac{2 \cdot I}{\pi \cdot \rho \cdot R^4}$$

$$ex 25.11861mm = \frac{2 \cdot 4.36E6kg^*mm^2}{\pi \cdot 7800kg/m^3 \cdot (345mm)^4}$$
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ex

Design of Flywheel Formulas...

19) Work Done per Cycle for Engine connected to Flywheel 🖸







# Variables Used

- **b**rim Width of Rim of Flywheel (Millimeter)
- Ce Coefficient of Fluctuation of Flywheel Energy
- C<sub>s</sub> Coefficient of Fluctuation of Flywheel Speed
- I Moment of Inertia of Flywheel (Kilogram Square Millimeter)
- **m** Coefficient of Steadiness for Flywheel
- M Bending moment in flywheel spokes (Newton Millimeter)
- n<sub>max</sub> Maximum Angular Speed of Flywheel (Revolution per Minute)
- **n**min Minimum Angular Speed of Flywheel (Revolution per Minute)
- **P** Tensile Force in Flywheel Rim (Newton)
- **r** Distance from Flywheel Centre (Millimeter)
- R Outer Radius of Flywheel (Millimeter)
- **t** Thickness of Flywheel (Millimeter)
- T<sub>1</sub> Driving Input Torque of Flywheel (Newton Millimeter)
- T<sub>2</sub> Load Output Torque of Flywheel (Newton Millimeter)
- T<sub>m</sub> Mean Torque for Flywheel (Newton Millimeter)
- t<sub>r</sub> Thickness of Rim of Flywheel (Millimeter)
- U Poisson Ratio for Flywheel
- **U<sub>0</sub>** Maximum Fluctuation of Energy for Flywheel (Joule)
- Uo Energy Output From Flywheel (Joule)
- Vperipheral Peripheral Speed of Flywheel (Meter per Second)
- W Work Done per Cycle for Engine (Joule)
- α Angular Acceleration of Flywheel (Radian per Square Second)
- ρ Mass Density of Flywheel (Kilogram per Cubic Meter)
- σ<sub>r</sub> Radial Stress in Flywheel (Newton per Square Millimeter)
- σ<sub>t</sub> Tangential Stress in Flywheel (Newton per Square Millimeter)
- $\sigma_{t,max}$  Maximum Radial Tensile Stress in Flywheel (Newton per Square Millimeter)
- $\sigma t_s$  Tensile Stress in Spokes of Flywheel (Newton per Square Millimeter)
- ω Mean Angular Speed of Flywheel (*Revolution per Minute*)



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# **Constants, Functions, Measurements used**

- Constant: pi, 3.14159265358979323846264338327950288 Archimedes' constant
- Measurement: Length in Millimeter (mm) Length Unit Conversion
- Measurement: Speed in Meter per Second (m/s) Speed Unit Conversion
- Measurement: Energy in Joule (J) Energy Unit Conversion
- Measurement: Force in Newton (N) Force Unit Conversion
- Measurement: Angular Velocity in Revolution per Minute (rev/min) Angular Velocity Unit Conversion
- Measurement: Density in Kilogram per Cubic Meter (kg/m³) Density Unit Conversion
- Measurement: Torque in Newton Millimeter (N\*mm) Torque Unit Conversion
- Measurement: Moment of Inertia in Kilogram Square Millimeter (kg\*mm<sup>2</sup>) Moment of Inertia Unit Conversion
- Measurement: Moment of Force in Newton Millimeter (N\*mm) Moment of Force Unit Conversion
- Measurement: Angular Acceleration in Radian per Square Second (rad/s<sup>2</sup>) Angular Acceleration Unit Conversion
- Measurement: Stress in Newton per Square Millimeter (N/mm<sup>2</sup>) Stress Unit Conversion





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- Design of Chain Drives Formulas
- Design of Cotter Joint Formulas
- Design of Coupling Formulas G
- Design of Flywheel Formulas G
- Design of Friction Clutches Formulas
- Design of Helical Gears Formulas G

- Design of Keys Formulas
- Design of Knuckle Joint Formulas G
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