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Angular Velocity Formulas

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List of 11 Angular Velocity Formulas

Angular Velocity

1) Angular Velocity of Driven Wheel given Longitudinal Slip Velocity, Velocity of Free Rolling Wheel

fx $\Omega = s_{ltd} + \Omega_0$ Open Calculator

ex $58.5\text{rad/s} = 9\text{rad/s} + 49.5\text{rad/s}$

2) Angular Velocity of Driven Wheel given Slip Ratio and Angular Velocity of Free Rolling Wheel

fx $\Omega = (SR + 1) \cdot \Omega_0$ Open Calculator

ex $58.41\text{rad/s} = (0.18 + 1) \cdot 49.5\text{rad/s}$

3) Angular Velocity of Free Rolling Wheel given Longitudinal Slip Velocity, Velocity of Driven Wheel

fx $\Omega_0 = \Omega - s_{ltd}$ Open Calculator

ex $49.5\text{rad/s} = 58.5\text{rad/s} - 9\text{rad/s}$

4) Angular Velocity of Free Rolling Wheel given Slip Ratio and Angular Velocity of Driven Wheel

Open Calculator

fx $$\Omega_0 = \frac{\Omega}{SR + 1}$$

ex $$49.57627\text{rad/s} = \frac{58.5\text{rad/s}}{0.18 + 1}$$

5) Curb Force for Driven Wheel

Open Calculator

fx $$F = \frac{G \cdot s}{r_d - h}$$

ex $$4426.829\text{N} = \frac{5000\text{N} \cdot 0.363\text{m}}{0.55\text{m} - 0.14\text{m}}$$

6) Maximum Permissible Speed on Transitioned Curves

Open Calculator

fx $$V_{max} = 0.347 \cdot \sqrt{(C_a + C_d) \cdot R_{curvature}}$$

ex $$0.716687\text{m/s} = 0.347 \cdot \sqrt{(130\text{mm} + 150\text{mm}) \cdot 15235\text{mm}}$$

7) Mechanical Advantage of Wheel and Axle

Open Calculator

fx $$MA = \frac{r_d}{R_a}$$

ex $$5.641026 = \frac{0.55\text{m}}{0.0975\text{m}}$$

8) Normal Load on Wheels due to Gradient

Open Calculator

fx $$F_N = M_v \cdot g \cdot \cos(\alpha)$$

ex $$76365.74\text{N} = 9000\text{N} \cdot 9.8\text{m/s}^2 \cdot \cos(0.524\text{rad})$$

9) Variation of Rolling Resistance Coefficient at Varying Speed

Open Calculator

fx $$f_r = 0.01 \cdot \left(1 + \frac{V}{100}\right)$$

ex $$0.0145 = 0.01 \cdot \left(1 + \frac{45\text{m/s}}{100}\right)$$

10) Wheel Flop

Open Calculator

fx $$f = T_m \cdot \sin(\theta) \cdot \cos(\theta)$$

ex $$4.330127\text{mm} = 10\text{mm} \cdot \sin(30^\circ) \cdot \cos(30^\circ)$$

11) Wheel Force

Open Calculator

fx $$F_w = 2 \cdot T \cdot \frac{\eta_t}{D_{wheel}} \cdot \frac{N}{n_{w\_rpm}}$$

ex $$6353.44\text{N} = 2 \cdot 140\text{N*m} \cdot \frac{0.83}{.350\text{m}} \cdot \frac{500}{499\text{rev/min}}$$

Variables Used

- C_a Cant *(Millimeter)*
- C_d Cant Deficiency *(Millimeter)*
- D_{wheel} Diameter of Wheel *(Meter)*
- f Wheel Flop Factor *(Millimeter)*
- F Curb Force for Driven Wheel *(Newton)*
- F_N Normal Load on Wheels due to Gradient *(Newton)*
- f_r Rolling Resistance Coefficient
- F_w Wheel Force *(Newton)*
- g Acceleration due to Gravity *(Meter per Square Second)*
- G Weight on Single Wheel *(Newton)*
- h Height of Curb *(Meter)*
- M_v Vehicle Weight in Newtons *(Newton)*
- MA Mechanical Advantage of Wheel and Axle
- N Engine Speed in RPM
- n_{w_rpm} Wheel Speed *(Revolution per Minute)*
- R_a Radius of Axle *(Meter)*
- $R_{curvature}$ Radius of Curvature *(Millimeter)*
- r_d Effective Radius of Wheel *(Meter)*
- s Contact Point Distance from Wheel Center Axis *(Meter)*
- s_{ltd} Longitudinal Slip Angular Velocity *(Radian per Second)*
- SR Slip Ratio
- T Engine Torque *(Newton Meter)*

- T_m Trail *(Millimeter)*
- V Vehicle Speed *(Meter per Second)*
- V_{max} Maximum Velocity *(Meter per Second)*
- α Angle of Inclination of Ground from Horizontal *(Radian)*
- η_t Transmission Efficiency of Vehicle
- θ Head Angle *(Degree)*
- Ω Angular Velocity of Driven or Braked Wheel *(Radian per Second)*
- Ω_0 Angular Velocity of Free Rolling Wheel *(Radian per Second)*

Constants, Functions, Measurements used

- Function: **cos**, cos(Angle)
  Cosine of an angle is the ratio of the side adjacent to the angle to the hypotenuse of the triangle.
- Function: **sin**, sin(Angle)
  Sine is a trigonometric function that describes the ratio of the length of the opposite side of a right triangle to the length of the hypotenuse.
- Function: **sqrt**, sqrt(Number)
  A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- Measurement: **Length** in Meter (m), Millimeter (mm)
  Length Unit Conversion
- Measurement: **Speed** in Meter per Second (m/s)
  Speed Unit Conversion
- Measurement: **Acceleration** in Meter per Square Second (m/s²)
  Acceleration Unit Conversion
- Measurement: **Force** in Newton (N)
  Force Unit Conversion
- Measurement: **Angle** in Radian (rad), Degree (°)
  Angle 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

- **Angular Velocity Formulas**
- **Tire Rolling and Slipping Formulas**
- **Wheel Parameters Formulas**

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