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Acceleration of the Follower Formulas

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List of 19 Acceleration of the Follower Formulas

Acceleration of the Follower

1) Acceleration of Follower after Time t for Cycloidal Motion

Open Calculator

fx $$a = \frac{2 \cdot \pi \cdot \omega^2 \cdot S}{\theta_o^2} \cdot \sin\left(\frac{2 \cdot \pi \cdot \theta_r}{\theta_o}\right)$$

ex $$18.83455\text{m/s}^2 = \frac{2 \cdot \pi \cdot (27\text{rad/s})^2 \cdot 20\text{m}}{(22\text{rad})^2} \cdot \sin\left(\frac{2 \cdot \pi \cdot 0.349\text{rad}}{22\text{rad}}\right)$$

2) Acceleration of Follower for Circular Arc Cam if there's Contact on Circular Flank

Open Calculator

fx $$a = \omega^2 \cdot (R - r_1) \cdot \cos(\theta_t)$$

ex $$18.22429\text{m/s}^2 = (27\text{rad/s})^2 \cdot (4.955\text{m} - 4.98\text{m}) \cdot \cos(22.0\text{rad})$$

3) Acceleration of Follower for Roller Follower Tangent Cam, there's Contact with Straight Flanks

Open Calculator

fx $$a = \omega^2 \cdot (r_1 + r_{rol}) \cdot \frac{(2 - \cos(\theta))^2}{(\cos(\theta))^3}$$

ex $$41574.1\text{m/s}^2 = (27\text{rad/s})^2 \cdot (4.98\text{m} + 31\text{m}) \cdot \frac{(2 - \cos(0.43\text{rad}))^2}{(\cos(0.43\text{rad}))^3}$$

4) Acceleration of Follower of Roller Follower Tangent Cam, there's Contact with Nose

Open Calculator

fx $$a = \omega^2 \cdot r \cdot \left(\cos(\theta_1) + \frac{L^2 \cdot r \cdot \cos(2 \cdot \theta_1) + r^3 \cdot (\sin(\theta_1))^4}{\sqrt{L^2 - r^2 \cdot (\sin(\theta_1))^2}}\right)$$

ex $$9.3529\text{m/s}^2 = (27\text{rad/s})^2 \cdot 0.012\text{m} \cdot \left(\cos(6.5\text{rad}) + \frac{(8.5\text{m})^2 \cdot 0.012\text{m} \cdot \cos(2 \cdot 6.5\text{rad}) + (0.012\text{m})^3 \cdot (\sin(6.5$$

5) Centripetal Acceleration of Point P on Circumference

Open Calculator

$$a_c = \frac{\pi^2 \cdot \omega^2 \cdot S}{2 \cdot \theta_o^2}$$

$$148.6558\text{m/s}^2 = \frac{\pi^2 \cdot (27\text{rad/s})^2 \cdot 20\text{m}}{2 \cdot (22\text{rad})^2}$$

6) Centripetal Acceleration of Point P on Circumference when Follower Moves with SHM

Open Calculator

$$a_c = \frac{2 \cdot P_s^2}{S}$$

$$25.6\text{m/s}^2 = \frac{2 \cdot (16\text{m/s})^2}{20\text{m}}$$

7) Max Acceleration of Follower during Outstroke if Outstroke Velocity is known Uniform Acceleration

Open Calculator

$$a_{max} = \frac{2 \cdot V_{max}}{t_o}$$

$$15.22481\text{m/s}^2 = \frac{2 \cdot 49.1\text{m/s}}{6.45\text{s}}$$

8) Max Acceleration of Follower during Outstroke if Stroke of Follower is known Uniform Acceleration

Open Calculator

$$a_{max} = \frac{4 \cdot \omega \cdot S}{\theta_o \cdot t_o}$$

$$15.22199\text{m/s}^2 = \frac{4 \cdot 27\text{rad/s} \cdot 20\text{m}}{22\text{rad} \cdot 6.45\text{s}}$$

9) Max Acceleration of Follower during Return Stroke if Follower Speed is known Uniform Acceleration

Open Calculator

$$a_{max} = \frac{2 \cdot V_{max}}{t_R}$$

$$21.82222\text{m/s}^2 = \frac{2 \cdot 49.1\text{m/s}}{4.5\text{s}}$$

10) Max Acceleration of Follower during Return Stroke if Follower Stroke is Known Uniform Acceleration

Open Calculator

$$a_{max} = \frac{4 \cdot \omega \cdot S}{\theta_R \cdot t_R}$$

$$6.193548\text{m/s}^2 = \frac{4 \cdot 27\text{rad/s} \cdot 20\text{m}}{77.5\text{rad} \cdot 4.5\text{s}}$$

11) Maximum Acceleration of Follower during Outstroke for Cycloidal Motion

Open Calculator

fx $$a_{max} = \frac{2 \cdot \pi \cdot \omega^2 \cdot S}{\theta_o^2}$$

ex $$189.2745\text{m/s}^2 = \frac{2 \cdot \pi \cdot (27\text{rad/s})^2 \cdot 20\text{m}}{(22\text{rad})^2}$$

12) Maximum Acceleration of Follower during Return Stroke for Cycloidal Motion

Open Calculator

fx $$a_{max} = \frac{2 \cdot \pi \cdot \omega^2 \cdot S}{\theta_R^2}$$

ex $$15.25225\text{m/s}^2 = \frac{2 \cdot \pi \cdot (27\text{rad/s})^2 \cdot 20\text{m}}{(77.5\text{rad})^2}$$

13) Maximum Acceleration of Follower for Tangent Cam with Roller Follower

Open Calculator

fx $$a_{max} = \omega^2 \cdot (r_1 + r_{rol}) \cdot \left(\frac{2 - (\cos(\varphi))^2}{(\cos(\varphi))^3} \right)$$

ex $$47728.36\text{m/s}^2 = (27\text{rad/s})^2 \cdot (4.98\text{m} + 31\text{m}) \cdot \left(\frac{2 - (\cos(0.5\text{rad}))^2}{(\cos(0.5\text{rad}))^3} \right)$$

14) Maximum Acceleration of Follower on Outstroke when Follower Moves with SHM

Open Calculator

fx $$a_{max} = \frac{\pi^2 \cdot \omega^2 \cdot S}{2 \cdot \theta_o^2}$$

ex $$148.6558\text{m/s}^2 = \frac{\pi^2 \cdot (27\text{rad/s})^2 \cdot 20\text{m}}{2 \cdot (22\text{rad})^2}$$

15) Maximum Acceleration of Follower on Return Stroke when Follower Moves with SHM

Open Calculator

fx $$a_{max} = \frac{\pi^2 \cdot \omega^2 \cdot S}{2 \cdot \theta_R^2}$$

ex $$11.97909\text{m/s}^2 = \frac{\pi^2 \cdot (27\text{rad/s})^2 \cdot 20\text{m}}{2 \cdot (77.5\text{rad})^2}$$

16) Maximum Uniform Acceleration of Follower during Outstroke

Open Calculator

fx $$a_{max} = \frac{4 \cdot \omega^2 \cdot S}{\theta_o^2}$$

ex $$120.4959\text{m/s}^2 = \frac{4 \cdot (27\text{rad/s})^2 \cdot 20\text{m}}{(22\text{rad})^2}$$

17) Maximum Uniform Acceleration of Follower during Return Stroke

Open Calculator

fx $$a_{max} = \frac{4 \cdot \omega^2 \cdot S}{\theta_R^2}$$

ex $$9.709886\text{m/s}^2 = \frac{4 \cdot (27\text{rad/s})^2 \cdot 20\text{m}}{(77.5\text{rad})^2}$$

18) Minimum Acceleration of Follower for Circular Arc Cam Contacting with Circular Flank

Open Calculator

fx $$a = \omega^2 \cdot (R - r_1) \cdot \cos(\alpha_2)$$

ex $$18.17346\text{m/s}^2 = (27\text{rad/s})^2 \cdot (4.955\text{m} - 4.98\text{m}) \cdot \cos(9.5\text{rad})$$

19) Minimum Acceleration of Follower for Tangent Cam with Roller Follower

Open Calculator

fx $$a = \omega^2 \cdot (r_1 + r_{rol})$$

ex $$26229.42\text{m/s}^2 = (27\text{rad/s})^2 \cdot (4.98\text{m} + 31\text{m})$$

Variables Used

- **a** Acceleration of Follower *(Meter per Square Second)*
- a_c Centripetal Acceleration *(Meter per Square Second)*
- a_{max} Maximum Acceleration *(Meter per Square Second)*
- **L** Distance b/w Roller Centre and Nose Centre *(Meter)*
- P_s Peripheral Speed *(Meter per Second)*
- **r** Distance b/w Cam Center and Nose Center *(Meter)*
- **R** Radius of Circular Flank *(Meter)*
- r_1 Radius of the Base Circle *(Meter)*
- r_{rol} Radius of Roller *(Meter)*
- **S** Stroke of Follower *(Meter)*
- t_o Time Required for the Outstroke *(Second)*
- t_R Time Required for the Return Stroke *(Second)*
- V_{max} Maximum Velocity of Follower *(Meter per Second)*
- α_2 Total Angle of Action of Cam *(Radian)*
- θ Angle Turned by Cam from Beginning of Roller *(Radian)*
- θ_1 Angle Turned by Cam When Roller is at Nose Top *(Radian)*
- θ_o Angular Displacement of Cam During Out Stroke *(Radian)*
- θ_r Angle Through Which Cam Rotates *(Radian)*
- θ_R Angular Displacement of Cam During Return Stroke *(Radian)*
- θ_t Angle Turned by Cam *(Radian)*
- φ Angle Turned by the Cam for Contact of Roller *(Radian)*
- ω Angular Velocity of Cam *(Radian per Second)*

Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- 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)
  Length Unit Conversion
- Measurement: **Time** in Second (s)
  Time 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: **Angle** in Radian (rad)
  Angle Unit Conversion
- Measurement: **Angular Velocity** in Radian per Second (rad/s)
  Angular Velocity Unit Conversion

Check other formula lists

- **Acceleration of the Follower Formulas**
- **Cam and Follower Formulas**
- **Maximum Velocity of the Follower Formulas**

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