Important Stick Forces and Hinge Moments Formulas PDF

Formulas
Examples
with Units

List of 23
Important Stick Forces and Hinge Moments Formulas

1) Control stick length for given gearing ratio Formula

Evaluate Formula

Formula

$$l_s = \frac{\delta_e}{G \cdot \delta_s}$$

Example with Units

$$0.215\,\text{m} = \frac{0.1\,\text{rad}}{0.930233\,\text{m}^{-1} \cdot 0.5\,\text{rad}}$$

2) Elevator Area given Hinge Moment Coefficient Formula

Evaluate Formula

Formula

$$S_e = \frac{H_e}{Ch_e \cdot 0.5 \cdot \rho \cdot V^2 \cdot c_e}$$

Example with Units

$$0.0245\,\text{m}^2 = \frac{25\,\text{N*m}}{0.770358 \cdot 0.5 \cdot 1.225\,\text{kg/m}^3 \cdot 60\,\text{m/s}^2 \cdot 0.6\,\text{m}}$$

3) Elevator Area given Stick Force Formula

Evaluate Formula

Formula

$$S_e = \frac{F}{G \cdot Ch_e \cdot 0.5 \cdot \rho \cdot V^2 \cdot c_e}$$

Example with Units

$$0.0245\,\text{m}^2 = \frac{23.25581\,\text{N}}{0.930233\,\text{m}^{-1} \cdot 0.770358 \cdot 0.5 \cdot 1.225\,\text{kg/m}^3 \cdot 60\,\text{m/s}^2 \cdot 0.6\,\text{m}}$$

4) Elevator Chord Length given Hinge Moment Coefficient Formula

Evaluate Formula

Formula

$$c_e = \frac{H_e}{Ch_e \cdot 0.5 \cdot \rho \cdot V^2 \cdot S_e}$$

Example with Units

$$0.5997\,\text{m} = \frac{25\,\text{N*m}}{0.770358 \cdot 0.5 \cdot 1.225\,\text{kg/m}^3 \cdot 60\,\text{m/s}^2 \cdot 0.02454\,\text{m}^2}$$

5) Elevator Chord Length given Stick Force Formula

Evaluate Formula

Formula

$$c_e = \frac{F}{G \cdot Ch_e \cdot 0.5 \cdot \rho \cdot V^2 \cdot S_e}$$

Example with Units

$$0.5997\,\text{m} = \frac{23.25581\,\text{N}}{0.930233\,\text{m}^{-1} \cdot 0.770358 \cdot 0.5 \cdot 1.225\,\text{kg/m}^3 \cdot 60\,\text{m/s}^2 \cdot 0.02454\,\text{m}^2}$$

6) Elevator Deflection Angle for given Stick Force Formula

Evaluate Formula

Formula

$$\delta_e = F \cdot l_s \cdot \frac{\delta_s}{H_e}$$

Example with Units

$$0.1\,\text{rad} = 23.25581\,\text{N} \cdot 0.215\,\text{m} \cdot \frac{0.5\,\text{rad}}{25\,\text{N*m}}$$

7) Elevator Deflection Angle given Gearing Ratio Formula

Evaluate Formula

Formula

$$\delta_e = G \cdot l_s \cdot \delta_s$$

Example with Units

$$0.1\,\text{rad} = 0.930233\,\text{m}^{-1} \cdot 0.215\,\text{m} \cdot 0.5\,\text{rad}$$

8) Elevator Hinge moment coefficient Formula

Evaluate Formula

Formula

$$Ch_e = \frac{H_e}{0.5 \cdot \rho \cdot V^2 \cdot S_e \cdot c_e}$$

Example with Units

$$0.77 = \frac{25\,\text{N*m}}{0.5 \cdot 1.225\,\text{kg/m}^3 \cdot 60\,\text{m/s}^2 \cdot 0.02454\,\text{m}^2 \cdot 0.6\,\text{m}}$$

9) Elevator Hinge Moment given Hinge Moment Coefficient Formula

Evaluate Formula

Formula

$$H_e = Ch_e \cdot 0.5 \cdot \rho \cdot V^2 \cdot S_e \cdot c_e$$

Example with Units

$$25.0108\,\text{N*m} = 0.770358 \cdot 0.5 \cdot 1.225\,\text{kg/m}^3 \cdot 60\,\text{m/s}^2 \cdot 0.02454\,\text{m}^2 \cdot 0.6\,\text{m}$$

10) Elevator Stick Force Formula

Evaluate Formula

Formula

$$F = \delta_e \cdot \frac{H_e}{l_s \cdot \delta_s}$$

Example with Units

$$23.2558\,\text{N} = 0.1\,\text{rad} \cdot \frac{25\,\text{N*m}}{0.215\,\text{m} \cdot 0.5\,\text{rad}}$$

11) Elevator Stick Force given Gearing Ratio Formula

Evaluate Formula

Formula

$$F = G \cdot H_e$$

Example with Units

$$23.2558\,\text{N} = 0.930233\,\text{m}^{-1} \cdot 25\,\text{N*m}$$

12) Elevator Stick Force given Hinge Moment Coefficient Formula

Evaluate Formula

Formula

$$F = G \cdot Ch_e \cdot 0.5 \cdot \rho \cdot V^2 \cdot c_e \cdot S_e$$

Example with Units

$$23.2658\,\text{N} = 0.930233\,\text{m}^{-1} \cdot 0.770358 \cdot 0.5 \cdot 1.225\,\text{kg/m}^3 \cdot 60\,\text{m/s}^2 \cdot 0.6\,\text{m} \cdot 0.02454\,\text{m}^2$$

13) Flight Velocity for given Stick Force Formula

Evaluate Formula

Formula

$$V = \sqrt{\frac{F}{G \cdot Ch_e \cdot 0.5 \cdot \rho \cdot S_e \cdot c_e}}$$

Example with Units

$$59.9871\,\text{m/s} = \sqrt{\frac{23.25581\,\text{N}}{0.930233\,\text{m}^{-1} \cdot 0.770358 \cdot 0.5 \cdot 1.225\,\text{kg/m}^3 \cdot 0.02454\,\text{m}^2 \cdot 0.6\,\text{m}}}$$

14) Flight Velocity given Elevator Hinge Moment Coefficient Formula

Evaluate Formula

Formula

$$V = \sqrt{\frac{H_e}{Ch_e \cdot 0.5 \cdot \rho \cdot S_e \cdot c_e}}$$

Example with Units

$$59.9871\,\text{m/s} = \sqrt{\frac{25\,\text{N*m}}{0.770358 \cdot 0.5 \cdot 1.225\,\text{kg/m}^3 \cdot 0.02454\,\text{m}^2 \cdot 0.6\,\text{m}}}$$

15) Gearing Ratio Formula

Evaluate Formula

Formula

$$G = \frac{\delta_e}{l_s \cdot \delta_s}$$

Example with Units

$$0.9302\,\text{m}^{-1} = \frac{0.1\,\text{rad}}{0.215\,\text{m} \cdot 0.5\,\text{rad}}$$

16) Gearing Ratio for given Stick Force Formula

Evaluate Formula

Formula

$$G = \frac{F}{H_e}$$

Example with Units

$$0.9302\,\text{m}^{-1} = \frac{23.25581\,\text{N}}{25\,\text{N*m}}$$

17) Gearing Ratio given Hinge Moment Coefficient Formula

Evaluate Formula

Formula

$$G = \frac{F}{Ch_e \cdot 0.5 \cdot \rho \cdot V^2 \cdot S_e \cdot c_e}$$

Example with Units

$$0.9298\,\text{m}^{-1} = \frac{23.25581\,\text{N}}{0.770358 \cdot 0.5 \cdot 1.225\,\text{kg/m}^3 \cdot 60\,\text{m/s}^2 \cdot 0.02454\,\text{m}^2 \cdot 0.6\,\text{m}}$$

18) Hinge Moment Coefficient given Stick Force Formula

Evaluate Formula

Formula

$$Ch_e = \frac{F}{G \cdot 0.5 \cdot \rho \cdot V^2 \cdot c_e \cdot S_e}$$

Example with Units

$$0.77 = \frac{23.25581\,\text{N}}{0.930233\,\text{m}^{-1} \cdot 0.5 \cdot 1.225\,\text{kg/m}^3 \cdot 60\,\text{m/s}^2 \cdot 0.6\,\text{m} \cdot 0.02454\,\text{m}^2}$$

19) Hinge Moment for given Gearing Ratio Formula

Evaluate Formula

Formula

$$H_e = \frac{F}{G}$$

Example with Units

$$25\,\text{N*m} = \frac{23.25581\,\text{N}}{0.930233\,\text{m}^{-1}}$$

20) Hinge Moment for given Stick Force Formula

Evaluate Formula

Formula

$$H_e = F \cdot l_s \cdot \frac{\delta_s}{\delta_e}$$

Example with Units

$$25\,\text{N*m} = 23.25581\,\text{N} \cdot 0.215\,\text{m} \cdot \frac{0.5\,\text{rad}}{0.1\,\text{rad}}$$

21) Stick Deflection Angle for given Gearing Ratio Formula

Evaluate Formula

Formula

$$\delta_s = \frac{\delta_e}{l_s \cdot G}$$

Example with Units

$$0.5\,\text{rad} = \frac{0.1\,\text{rad}}{0.215\,\text{m} \cdot 0.930233\,\text{m}^{-1}}$$

22) Stick Deflection Angle for given Stick Force Formula

Evaluate Formula

Formula

$$\delta_s = H_e \cdot \frac{\delta_e}{F \cdot l_s}$$

Example with Units

$$0.5\,\text{rad} = 25\,\text{N*m} \cdot \frac{0.1\,\text{rad}}{23.25581\,\text{N} \cdot 0.215\,\text{m}}$$

23) Stick Length for given Stick Force Formula

Evaluate Formula

Formula

$$l_s = H_e \cdot \frac{\delta_e}{F \cdot \delta_s}$$

Example with Units

$$0.215\,\text{m} = 25\,\text{N*m} \cdot \frac{0.1\,\text{rad}}{23.25581\,\text{N} \cdot 0.5\,\text{rad}}$$

Variables used in list of Stick Forces and Hinge Moments Formulas above

- c_e Elevator Chord *(Meter)*
- Ch_e Hinge Moment Coefficient
- S_e Elevator Area *(Square Meter)*
- V Flight Velocity *(Meter per Second)*
- δ_e Elevator Deflection Angle *(Radian)*
- δ_s Stick Deflection Angle *(Radian)*
- ρ Density *(Kilogram per Cubic Meter)*
- G Gearing Ratio *(1 per Meter)*
- H_e Hinge Moment *(Newton Meter)*
- l_s Stick Length *(Meter)*
- F Stick Force *(Newton)*

Constants, Functions, Measurements used in list of Stick Forces and Hinge Moments Formulas above

- Functions: **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: **Area** in Square Meter (m²)
  Area Unit Conversion
- Measurement: **Speed** in Meter per Second (m/s)
  Speed Unit Conversion
- Measurement: **Force** in Newton (N)
  Force Unit Conversion
- Measurement: **Angle** in Radian (rad)
  Angle Unit Conversion
- Measurement: **Density** in Kilogram per Cubic Meter (kg/m³)
  Density Unit Conversion
- Measurement: **Moment of Force** in Newton Meter (N*m)
  Moment of Force Unit Conversion
- Measurement: **Reciprocal Length** in 1 per Meter (m⁻¹)
  Reciprocal Length Unit Conversion

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