Important Radius of Fiber and Axis Formulas PDF

Formulas
Examples
with Units

List of 16
Important Radius of Fiber and Axis Formulas

1) Radius of centroidal axis of curved beam given bending stress Formula

Evaluate Formula

Formula

$$R = \left(\frac{M_b \cdot y}{A \cdot \sigma_b \cdot \left(R_N - y \right)} \right) + R_N$$

Example with Units

$$89.7279\,\text{mm} = \left(\frac{245000\,\text{N*mm} \cdot 21\,\text{mm}}{240\,\text{mm}^2 \cdot 53\,\text{N/mm}^2 \cdot \left(83.22787\,\text{mm} - 21\,\text{mm} \right)} \right) + 83.22787\,\text{mm}$$

2) Radius of centroidal axis of curved beam given eccentricity between axis Formula

Evaluate Formula

Formula

$$R = R_N + e$$

Example with Units

$$89.7279\,\text{mm} = 83.22787\,\text{mm} + 6.5\,\text{mm}$$

3) Radius of centroidal axis of curved beam of circular section given radius of inner fiber Formula

Evaluate Formula

Formula

$$R = R_i + \frac{d}{2}$$

Example with Units

$$86\,\text{mm} = 76\,\text{mm} + \frac{20\,\text{mm}}{2}$$

4) Radius of centroidal axis of curved beam of rectangular section given radius of inner fiber Formula

Evaluate Formula

Formula

$$R = R_i + \frac{y}{2}$$

Example with Units

$$86.5\,\text{mm} = 76\,\text{mm} + \frac{21\,\text{mm}}{2}$$

5) Radius of inner fiber of circular curved beam given radius of neutral axis and outer fiber Formula

Evaluate Formula

Formula

$$R_i = \left(\sqrt{4 \cdot R_N} - \sqrt{R_o} \right)^2$$

Example with Units

$$71.3671\,\text{mm} = \left(\sqrt{4 \cdot 83.22787\,\text{mm}} - \sqrt{96\,\text{mm}} \right)^2$$

6) Radius of inner fiber of curved beam given bending stress at fiber Formula

Evaluate Formula

Formula

$$R_i = \frac{M_b \cdot h_i}{A \cdot e \cdot \sigma_b i}$$

Example with Units

$$75.0245\,\text{mm} = \frac{245000\,\text{N*mm} \cdot 37.5\,\text{mm}}{240\,\text{mm}^2 \cdot 6.5\,\text{mm} \cdot 78.5\,\text{N/mm}^2}$$

7) Radius of inner fiber of curved beam of circular section given radius of centroidal axis Formula

Evaluate Formula

Formula

$$R_i = R - \frac{d}{2}$$

Example with Units

$$79.7279\,\text{mm} = 89.72787\,\text{mm} - \frac{20\,\text{mm}}{2}$$

8) Radius of inner fiber of rectangular curved beam given radius of neutral axis and outer fiber Formula

Evaluate Formula

Formula

$$R_i = \frac{R_o}{e^{\frac{y}{R_N}}}$$

Example with Units

$$74.5917\,\text{mm} = \frac{96\,\text{mm}}{e^{\frac{21\,\text{mm}}{83.22787\,\text{mm}}}}$$

9) Radius of inner fibre of curved beam of rectangular section given radius of centroidal axis Formula

Evaluate Formula

Formula

$$R_i = R - \frac{y}{2}$$

Example with Units

$$79.2279\,\text{mm} = 89.72787\,\text{mm} - \frac{21\,\text{mm}}{2}$$

10) Radius of neutral axis of curved beam given bending stress Formula

Evaluate Formula

Formula

$$R_N = \left(\frac{M_b \cdot y}{A \cdot \sigma_b \cdot e}\right) + y$$

Example with Units

$$83.2279\,\text{mm} = \left(\frac{245000\,\text{N*mm} \cdot 21\,\text{mm}}{240\,\text{mm}^2 \cdot 53\,\text{N/mm}^2 \cdot 6.5\,\text{mm}}\right) + 21\,\text{mm}$$

11) Radius of neutral axis of curved beam given eccentricity between axis Formula

Evaluate Formula

Formula

$$R_N = R - e$$

Example with Units

$$83.2279\,\text{mm} = 89.72787\,\text{mm} - 6.5\,\text{mm}$$

12) Radius of neutral axis of curved beam of circular section given radius of inner and outer fibre Formula

Evaluate Formula

Formula

$$R_N = \frac{\left(\sqrt{R_o} + \sqrt{R_i}\right)^2}{4}$$

Example with Units

$$85.7083\,\text{mm} = \frac{\left(\sqrt{96\,\text{mm}} + \sqrt{76\,\text{mm}}\right)^2}{4}$$

13) Radius of neutral axis of curved beam of rectangular section given radius of inner and outer fiber Formula

Evaluate Formula

Formula

$$R_N = \frac{y}{\ln\left(\frac{R_o}{R_i}\right)}$$

Example with Units

$$89.8915\,\text{mm} = \frac{21\,\text{mm}}{\ln\left(\frac{96\,\text{mm}}{76\,\text{mm}}\right)}$$

14) Radius of outer fiber of circular curved beam given radius of neutral axis and inner fiber Formula

Evaluate Formula

Formula

$$R_o = \left(\sqrt{4 \cdot R_N} - \sqrt{R_i}\right)^2$$

Example with Units

$$90.784\,\text{mm} = \left(\sqrt{4 \cdot 83.22787\,\text{mm}} - \sqrt{76\,\text{mm}}\right)^2$$

15) Radius of outer fiber of rectangular curved beam given radius of neutral axis and inner fiber Formula

Evaluate Formula

Formula

$$R_o = R_i \cdot e^{\frac{y}{R_N}}$$

Example with Units

$$97.8125\,\text{mm} = 76\,\text{mm} \cdot e^{\frac{21\,\text{mm}}{83.22787\,\text{mm}}}$$

16) Radius of outer fibre of curved beam given bending stress at fiber Formula

Evaluate Formula

Formula

$$R_o = \frac{M_b \cdot h_o}{A \cdot e \cdot \sigma_b o}$$

Example with Units

$$88.6878\,\text{mm} = \frac{245000\,\text{N*mm} \cdot 48\,\text{mm}}{240\,\text{mm}^2 \cdot 6.5\,\text{mm} \cdot 85\,\text{N/mm}^2}$$

Variables used in list of Radius of Fiber and Axis Formulas above

- **A** Cross Sectional Area of Curved Beam *(Square Millimeter)*
- **d** Diameter of Circular Curved Beam *(Millimeter)*
- **e** Eccentricity Between Centroidal and Neutral Axis *(Millimeter)*
- h_i Distance of Inner Fibre from Neutral Axis *(Millimeter)*
- h_o Distance of Outer Fibre from Neutral Axis *(Millimeter)*
- M_b Bending Moment in Curved Beam *(Newton Millimeter)*
- **R** Radius of Centroidal Axis *(Millimeter)*
- R_i Radius of Inner Fibre *(Millimeter)*
- R_N Radius of Neutral Axis *(Millimeter)*
- R_o Radius of Outer Fibre *(Millimeter)*
- **y** Distance from Neutral Axis of Curved Beam *(Millimeter)*
- σ_b Bending Stress *(Newton per Square Millimeter)*
- $\sigma_b i$ Bending Stress at Inner Fibre *(Newton per Square Millimeter)*
- $\sigma_b o$ Bending Stress at Outer Fibre *(Newton per Square Millimeter)*

Constants, Functions, Measurements used in list of Radius of Fiber and Axis Formulas above

- constant(s): **e**, 2.71828182845904523536028747135266249 *Napier's constant*
- Functions: **ln**, ln(Number) *The natural logarithm, also known as the logarithm to the base e, is the inverse function of the natural exponential function.*
- 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 Millimeter (mm) *Length Unit Conversion*
- Measurement: **Area** in Square Millimeter (mm²) *Area Unit Conversion*
- Measurement: **Torque** in Newton Millimeter (N*mm) *Torque Unit Conversion*
- Measurement: **Stress** in Newton per Square Millimeter (N/mm²) *Stress Unit Conversion*

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