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Radius of Fiber and Axis Formulas

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List of 16 Radius of Fiber and Axis Formulas

Radius of Fiber and Axis

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

Open Calculator

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

ex $$89.72787\text{mm} = \left(\frac{245000\text{N*mm} \cdot 21\text{mm}}{240\text{mm}^2 \cdot 53\text{N/mm}^2 \cdot (83.22787\text{mm} - 21\text{mm})} \right) + 83.22787\text{mm}$$

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

Open Calculator

fx $$R = R_N + e$$

ex $$89.72787\text{mm} = 83.22787\text{mm} + 6.5\text{mm}$$

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

Open Calculator

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

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

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

Open Calculator

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

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

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

Open Calculator

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

$$71.36707\text{mm} = \left(\sqrt{4 \cdot 83.22787\text{mm}} - \sqrt{96\text{mm}}\right)^2$$

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

Open Calculator

$$\mathrm{R_i} = \frac{\mathrm{M_b} \cdot \mathrm{h_i}}{\mathrm{A} \cdot \mathrm{e} \cdot (\sigma_\mathrm{b}\mathrm{i})}$$

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

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

Open Calculator

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

$$79.72787\text{mm} = 89.72787\text{mm} - \frac{20\text{mm}}{2}$$

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

Open Calculator

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

ex $$74.59167\text{mm} = \frac{96\text{mm}}{e^{\frac{21\text{mm}}{83.22787\text{mm}}}}$$

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

Open Calculator

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

ex $$79.22787\text{mm} = 89.72787\text{mm} - \frac{21\text{mm}}{2}$$

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

Open Calculator

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

ex $$83.22787\text{mm} = \left(\frac{245000\text{N*mm} \cdot 21\text{mm}}{240\text{mm}^2 \cdot 53\text{N/mm}^2 \cdot 6.5\text{mm}}\right) + 21\text{mm}$$

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

Open Calculator

fx $$R_N = R - e$$

ex $$83.22787\text{mm} = 89.72787\text{mm} - 6.5\text{mm}$$

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

Open Calculator

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

$$85.70831\text{mm} = \frac{\left(\sqrt{96\text{mm}} + \sqrt{76\text{mm}}\right)^2}{4}$$

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

Open Calculator

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

$$89.89155\text{mm} = \frac{21\text{mm}}{\ln\left(\frac{96\text{mm}}{76\text{mm}}\right)}$$

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

Open Calculator

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

$$90.78401\text{mm} = \left(\sqrt{4 \cdot 83.22787\text{mm}} - \sqrt{76\text{mm}}\right)^2$$

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

Open Calculator

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

$$97.81253\text{mm} = 76\text{mm} \cdot e^{\frac{21\text{mm}}{83.22787\text{mm}}}$$

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

Open Calculator

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

ex $$88.68778\text{mm} = \frac{245000\text{N*mm} \cdot 48\text{mm}}{240\text{mm}^2 \cdot 6.5\text{mm} \cdot 85\text{N/mm}^2}$$

Variables Used

- **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

- Constant: **e**, 2.71828182845904523536028747135266249
  Napier's constant
- Function: **ln**, ln(Number)
  The natural logarithm, also known as the logarithm to the base e, is the inverse function of the natural exponential function.
- 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 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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