MA-221(Numerical Analysis)
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Lab Assignment-2
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Provide the code for the following problems:

1. Convert the following numbers into the other number systems:
   (a) $(2655)_{10\to16}$
   (b) $(0.0101)_{2\to10}$
   (c) $(.AAAA\ldots)_{16\to8}$
   (d) $(347.623)_{8\to2}$

2. As part of a laboratory experiment, a group of students needs to calculate the modulus of elasticity E, of a steel beam. An object of mass $m = 0.491kg$ is suspended from one end of a beam whose length is $l = 0.451m$, width is $a = 0.021m$ and thickness is $b = 0.003m$. The resulting deflection of the tip of the beam is measured to be $d = 0.142m$. Substituting these values into the formula
$$E = \frac{4mgl^3}{dab^3},$$
where $g = 9.81m/s^2$ is the acceleration due to gravity, the students calculate
$$E = \frac{4(0.491)(9.81)(0.451)^3}{(0.142)(0.021)(0.003)^3} = 21.952 \times 10^9 N/m^2.$$
A standard table of properties of steel, however, indicates that the actual value should be $E = 30 \times 10^9 N/m^2$. Is the value calculated by the students within acceptable limits of the tabulated value?

3. A given calculation requires the value $\sqrt{7.1} \approx 2.66458$. The two most natural approaches to take would be chopping and rounding the number, producing $\sqrt{7.1} \approx 2.6$ and $\sqrt{7.1} \approx 2.7$, respectively, if we drop all the digits after second one. Calculate the absolute and relative error in both the cases.

4. Let $x_T = \pi$, $x_A = 3.1416$, $y_T = \frac{22}{7}$ and $y_A = 3.1429$. Calculate the relative error in x_A and y_A. Also calculate the relative error in-
   (a) $x_A + y_A$
   (b) $x_A - y_A$
   (c) $x_A.y_A$
   (d) x_A/y_A

5. Find the condition number of the following functions:
   (a) $f(x) = \sqrt{x}$, for all $x \in [0, \infty)$
   (b) $f(x) = \dfrac{10}{1-x^2}$, for all $x \in \mathbb{R}$