A09 Vibration calculator Assignment

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SDOF Free and forced vibration calculator

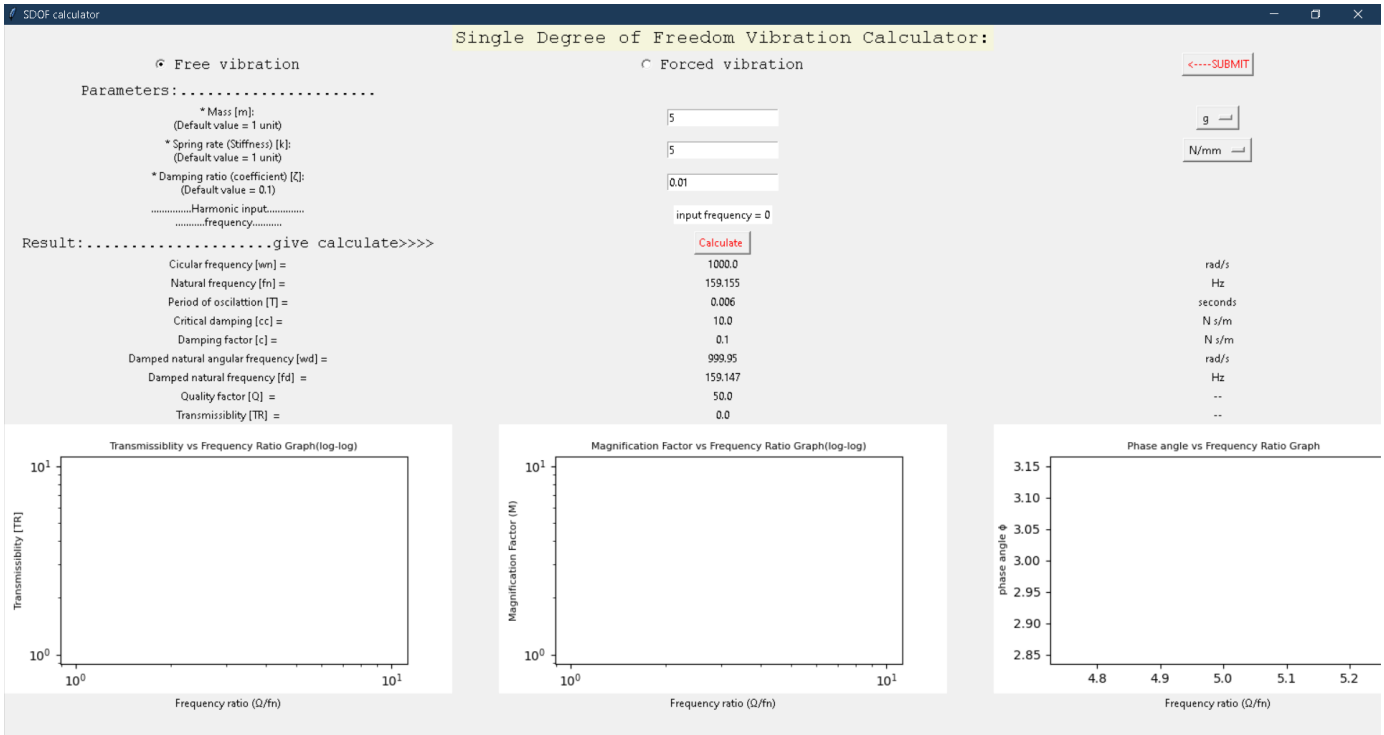
Single Degree of Freedom (SDOF) Vibration Calculator to calculate mass-spring-damper natural frequency, circular frequency, time period of oscillation, damping factor, Q factor, critical damping, damped natural frequency, damped natural angular frequency and transmissibility (if forced vibration) for a harmonic input.

- At first it takes the option for free or forced vibration.
- Later the inputs for mass, stiffness, damping ratio and Harmonic input frequency (if forced vibration) is taken along with the specified units
- If the input is not a number or it is blank, then the default value of mass is 1 unit, stiffness is 3600-unit, damping ratio is 0.1 and Harmonic input frequency is 10 Hz.

Free vibration:

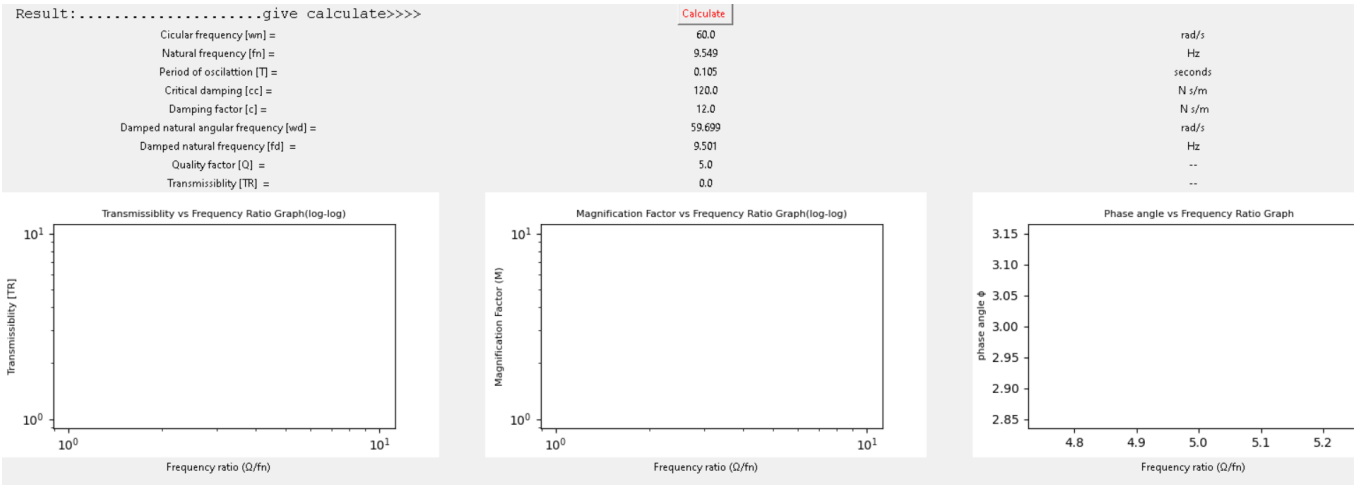
- The output is given. I.e. natural frequency, circular frequency, time period of oscillation, damping factor, Q factor, critical damping, damped natural frequency, Damped natural angular frequency
- For mass = 5-gram, stiffness = 5 N/mm, damping ratio = 0.01,

  The result obtained is below;



- If no input is given or the input is not a number then the output is given below;

- Output will be displayed with default values in SI unit;



- The same output will be there if the vibration is forced vibration with input harmonic frequency = 10 Hz
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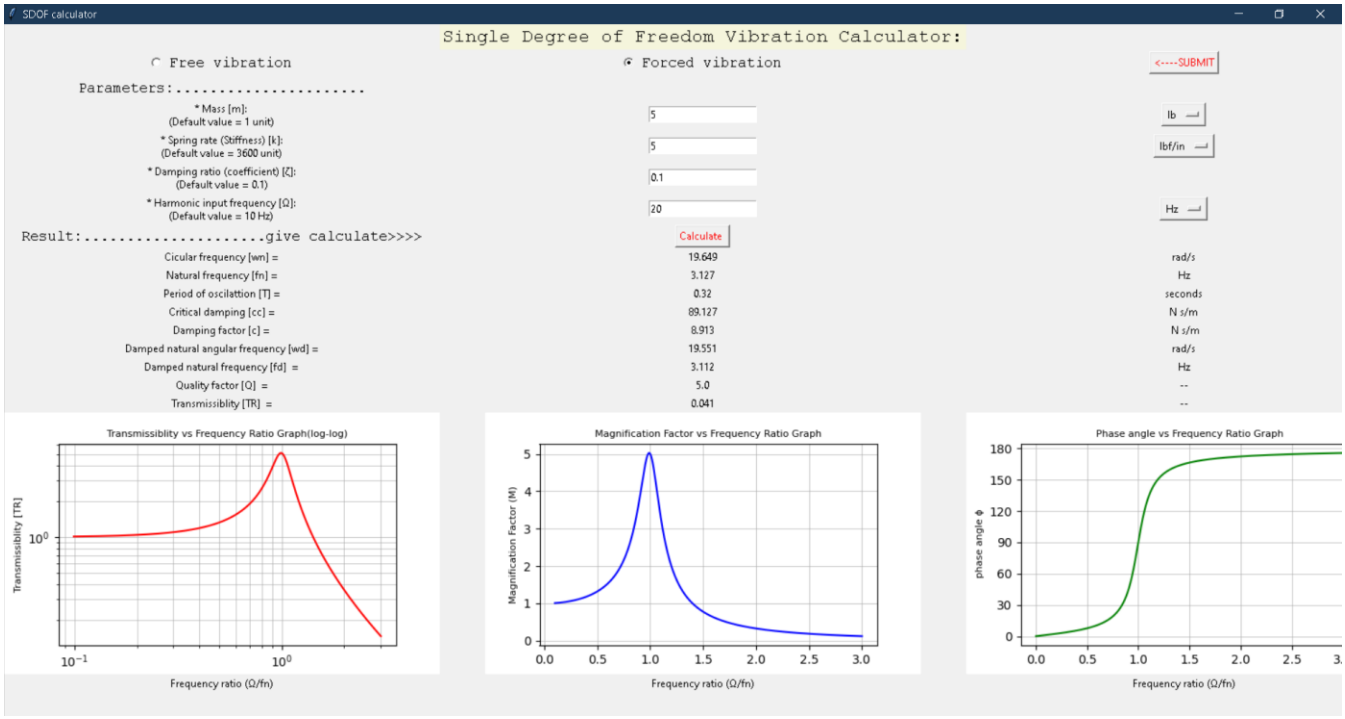
Forced vibration:

- The output is given. I.e. mass-spring-damper natural frequency, circular frequency, time period of oscillation, damping factor, Q factor, critical damping, damped natural frequency, Damped natural angular frequency and transmissibility for a harmonic input.
- A loglog graph of transmissibility vs frequency ratio is plotted.
- For mass = 5 lb, stiffness = 5 lbf/in, damping ratio = 0.1, harmonic input frequency = 20 Hz,

The result obtained is below;



- The graph obtained is:
    1. Loglog graph of transmissibility vs frequency ratio
    2. Graph of magnification factor vs frequency ratio
    3. Graph of phase angle vs frequency ratio

Process of programming:

- All coding is done in python language
- I have used python tkinter. Tkinter is a Python binding to the Tk GUI toolkit. It is the standard Python interface to the Tk GUI toolkit, and is Python's de facto standard GUI.
- The libraries required to run this program are tkinter, NumPy, math, matplotlib
- The code of this program(calc.py) and the video file (SDOF CAL GUI.mp4) is uploaded.
- The pdfs of all the pages is uploaded