Assignment #3

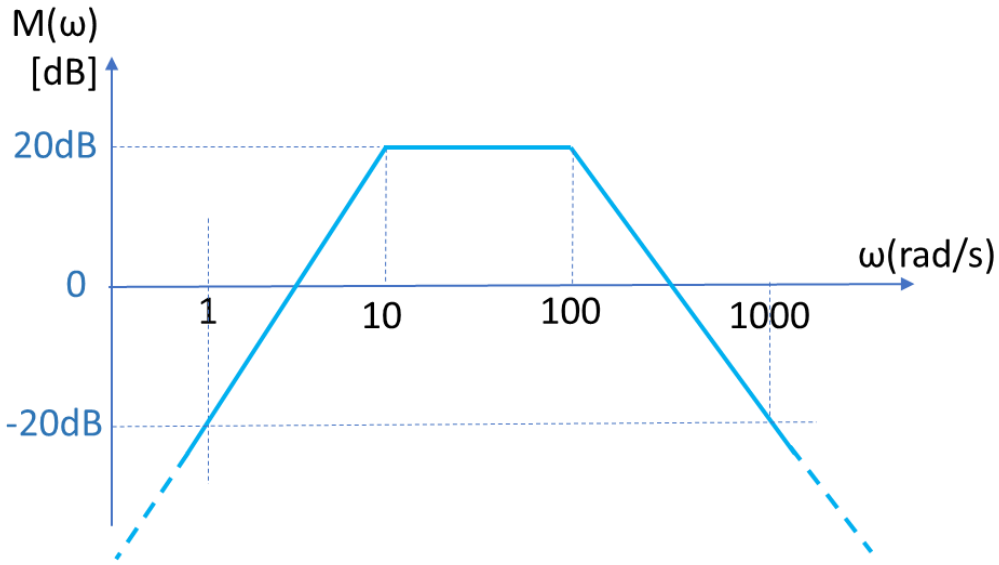
Signals and Systems for Computer Engineering

Assigned: April 27, 2021

Due: May 09, 2021, **23:59** (submit through Ninova)

- Your submission must include your code and report.
- In the report, briefly explain your solution and include your plots (if applicable).
- Use only the Python programming language.
- Please **write your full name** (first name and last name) and **Student ID** at the top of your solution.
- Please show ALL work. Answers with no supporting explanations or work will not receive any partial credit. Your homework is not just a final report of your results; we want to see your steps. Upload all your steps to get to the solution.
- Assignments are individual.
- Do not copy & paste anything from anywhere. Use your own words.
- **No late submissions** will be accepted. Do not send your solutions by e-mail. We will only accept files that have been uploaded to the Ninova e-learning system before the deadline. Do not risk leaving your submission to the last few minutes.
- If you have any questions regarding the assignment, please e-mail **Enes Albay (albay@itu.edu.tr)**.

Asymptotic frequency response (magnitude) graph of a band pass filter is given in the below diagram.



a) Write the transfer function of this system in "s" domain.
b) Draw the frequency response and the phase response of this band pass filter by using Python (provide your code that includes comments).
c) A continuous time signal is given as $x(t)=10(\sin(2\pi t)+\sin(10\pi t)+\sin(100\pi t)$. Analytically find and express the output signal y(t) when x(t) is applied to the defined band pass filter. Draw x(t) and y(t) for the first 2 seconds.
d) Write the pseudo code for digital implementation of the defined band pass filter where the sampling frequency will be considered as $f_s = 500$ Hz (Draw the discrete time direct programming scheme first).
e) Find and simulate the output signal y(t) by using python for the case that input signal x(t) is sampled at $f_s=500$ Hz and applied to the discrete time filter in "d". Compare the results of "c" and "e".