

## ECEN 325

### Homework #1

Due: February 1, 2024, 11:59PM

**Homeworks will not be received after due.**

Instructor: Sam Palermo

#### Complex Number Review (12 points)

For the 6 complex numbers, express/compute both the magnitude and phase angle

- |                |                                      |                                      |
|----------------|--------------------------------------|--------------------------------------|
| a. $a + jb$    | b. $\frac{a+jb}{c+jd}$               | c. $(a + jb)(a - jb)$                |
| d. $100 + j10$ | e. $\frac{100+j10}{(1+j10)(10+j10)}$ | f. $\frac{(1+j10)(10+j10)}{100+j10}$ |

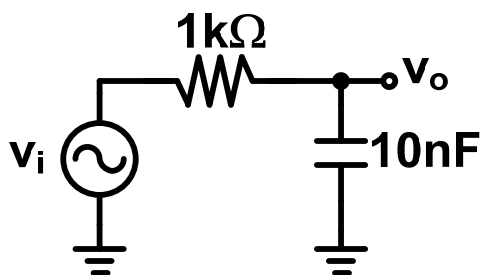
#### Transfer Functions & Bode Plots (88 points)

For the 4 following circuits:

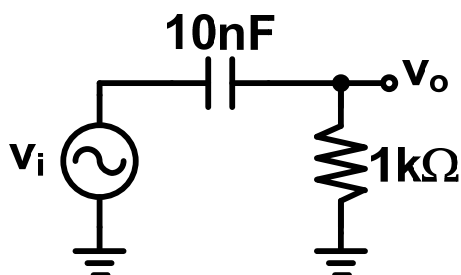
- Derive the AC transfer function,  $F(s)=v_o(s)/v_i(s)$  **(6 points)**
- Using bode approximations, plot by hand both the magnitude and phase response of the transfer function. **(5 points)**
- Plot both the exact magnitude and phase response using either MATLAB, MultiSim, or any other software package. **(5 points)**
- Report the values for DC gain, gain at infinite frequency, and the location of poles and zeros for each transfer function. Is the circuit a low-pass or high-pass filter? **(6 points)**

Hint:  $s=j\omega=j2\pi f$ , where  $f$ =frequency in Hz (cycles/second) and  $\omega$ =angular frequency in rads/sec

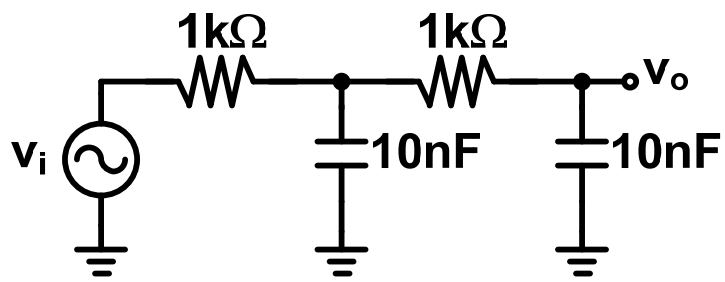
1.



2.



3.



4.

