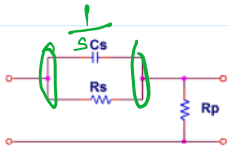


Quiz 1

Monday, September 26, 2016 8:41 AM

Consider the circuit shown in Fig. 1, derive the expression (step by step) of the voltage transfer function
Write down the expression for time constant and the corner frequency.



$$Z_s = \frac{1}{sC_s} \parallel R_s$$

$$= \frac{R_s \frac{1}{sC_s}}{R_s + \frac{1}{sC_s}} = \frac{R_s}{1 + sR_sC_s}$$

Draw the Bode plot (magnitude and phase) of the following transfer function. (10 marks)

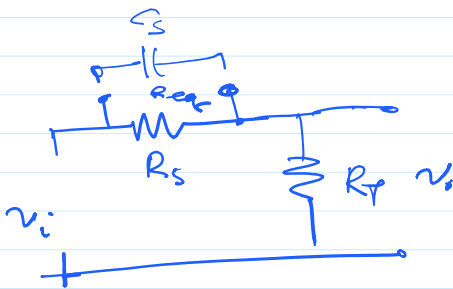
$$H(s) = \frac{10^6 s}{(s+5)(s+150)} = \frac{10^6 s}{5 \left[1 + \frac{s}{5}\right] 150 \left[1 + \frac{s}{150}\right]}$$

$$Z_p + Z_s = R_p + \frac{R_s}{1 + sR_sC_s}$$

$$= \frac{R_p + sR_sR_pC_s + R_s}{1 + sR_sC_s}$$

$$= \frac{(R_s + R_p) + sR_sR_pC_s}{1 + sR_sC_s}$$

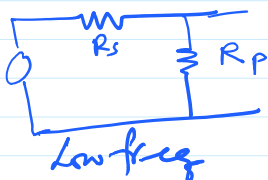
$$T(s) = \frac{Z_p}{Z_p + Z_s} = \frac{R_p (1 + sR_sC_s)}{(R_p + R_s) + sR_sR_pC_s}$$



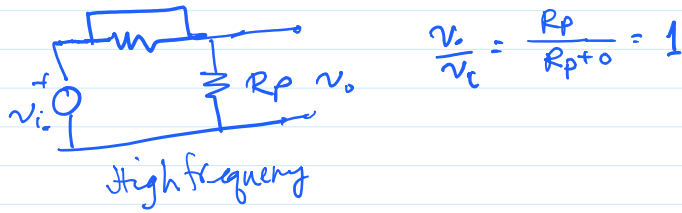
$$\tau_a = (R_s \parallel R_p) C_s$$

$$f = \frac{1}{2\pi\tau_a}$$

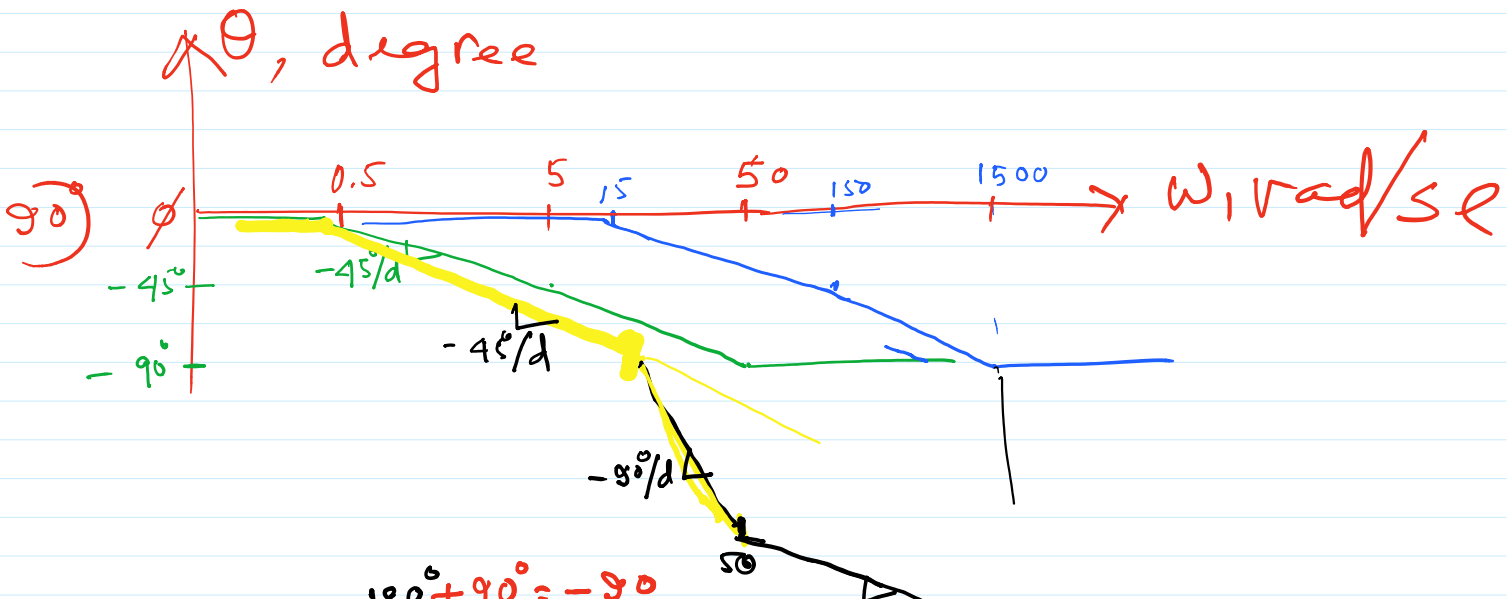
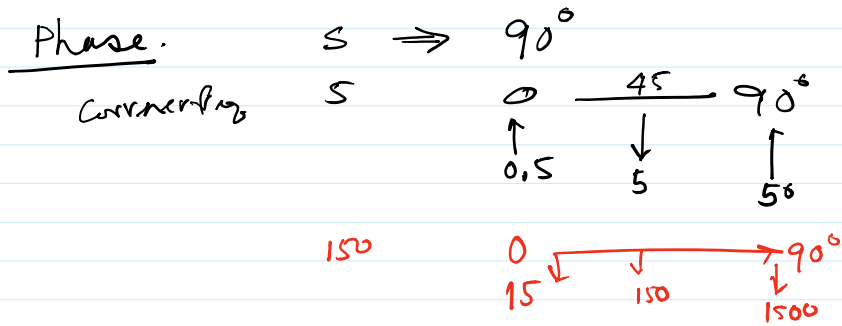
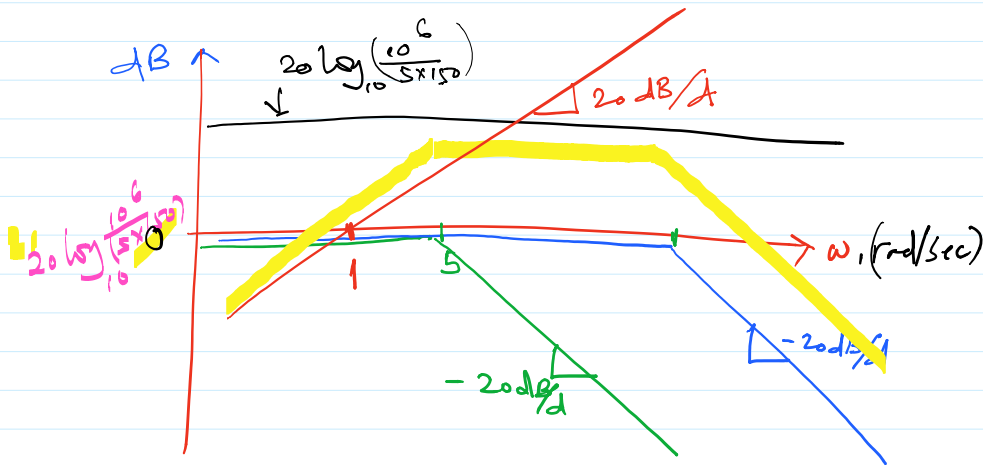
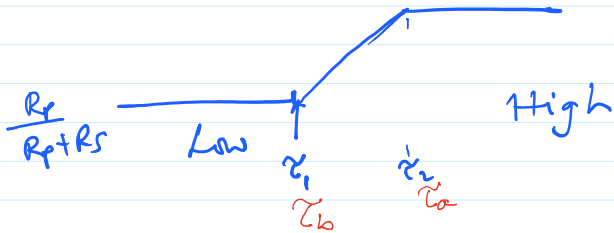
$$\tau_b = R_s C_s$$



$$T(s) \Big|_{\text{low freq}} = \frac{R_p}{R_p + R_s} = \frac{V_o}{V_i}$$



$$\frac{v_o}{v_i} = \frac{R_p}{R_p + j\omega C} = 1$$



$$-180^\circ + 90^\circ = -90^\circ$$

