Midterm II EEE 117 Date 04/12/2022 (1:30 - 2:45 p.m.)

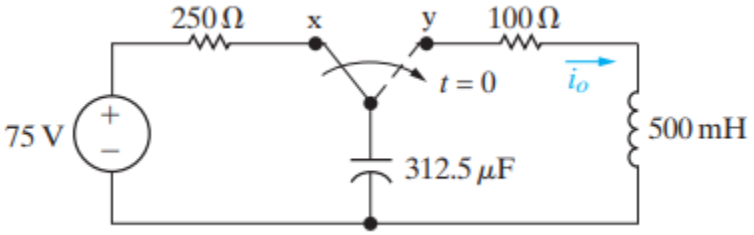
SOLUTION MUST BE HAND WRITTEN AND SUBMIT THEM BEFORE 3:00 P.M.

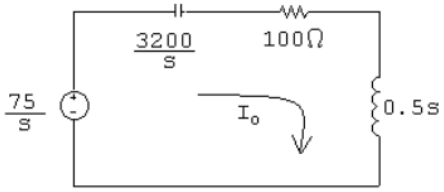
Q-1 The switch in the circuit shown below has been in position x for a long time. At t=0, the switch moves instantaneously to position y. (**40 points)**

a) Construct an s-domain circuit for t > 0

b) Find I_0

c) Find i_0





[b] $$I_o = \frac{75/s}{(3200/s) + 100 + 0.5s}$$

$$= \frac{75}{0.5s^2 + 100s + 3200}$$

$$= \frac{150}{(s^2 + 200s + 6400)} = \frac{150}{(s+40)(s+160)}$$

[c] $$I_o = \frac{K_1}{s+40} + \frac{K_2}{s+160}$$

$$K_1 = \left.\frac{150}{s+160}\right|_{s=-40} = 1.25$$

$$K_2 = \left.\frac{150}{s+40}\right|_{s=-160} = -1.25$$

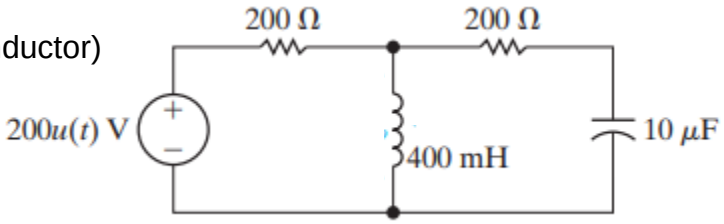
$$I_o = \frac{1.25}{s+40} - \frac{1.25}{s+160}$$

$$i_o(t) = (1.25e^{-40t} - 1.25e^{-160t})u(t)\ \text{A}$$

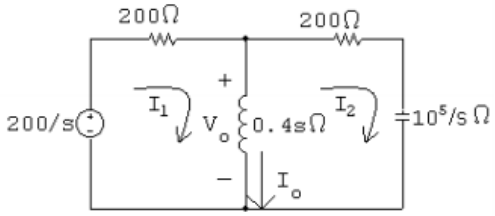
Q-2 There is no energy stored in the circuit shown below at t= 0^- **(20 points)**

a) Construct an s-domain circuit for t > 0

b) Find $V_0(s)$ (Voltage across inductor)



[a]



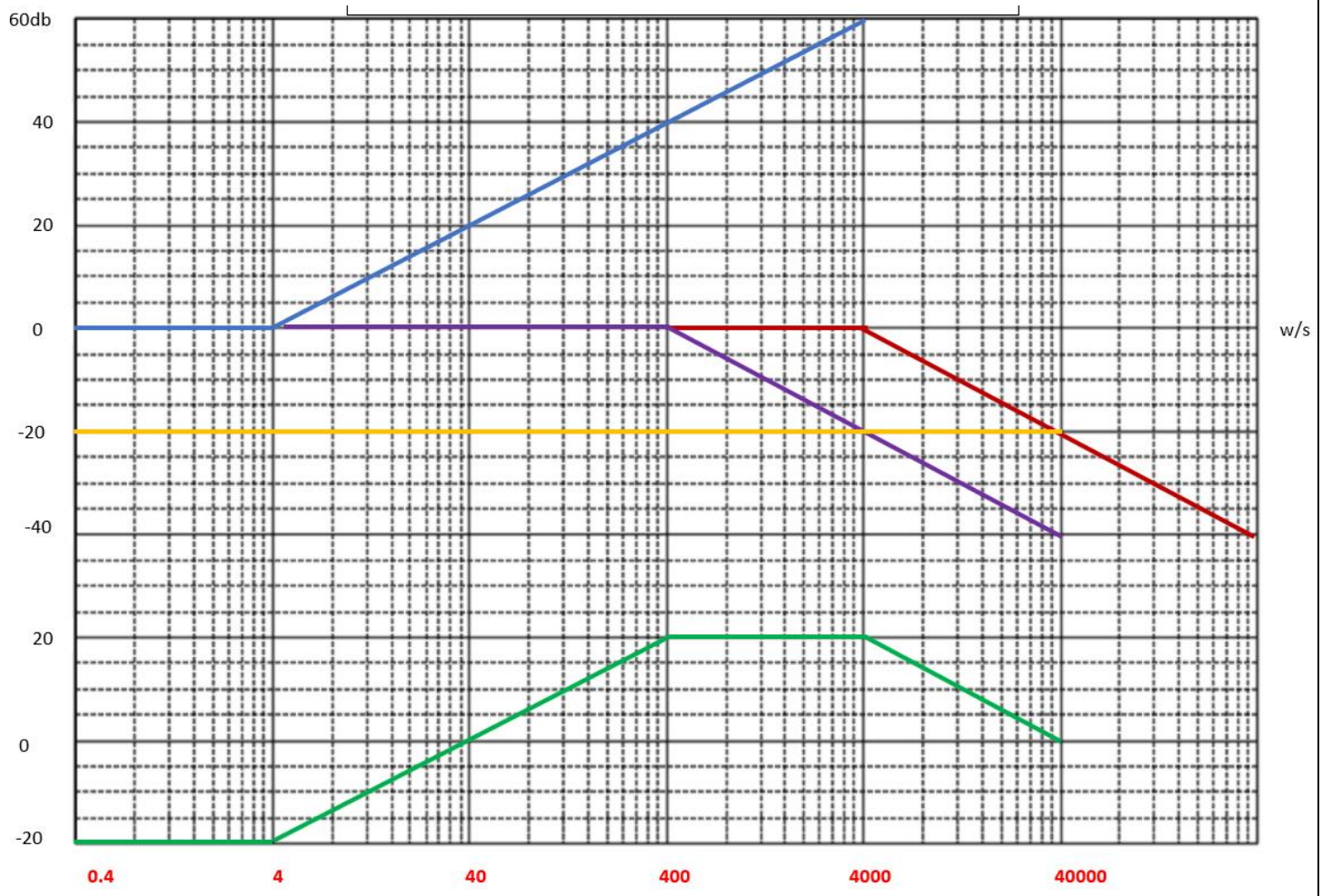
[b] $$V_o = 0.4sI_o = \frac{100(s+500)}{s^2 + 500s + 125{,}000}$$

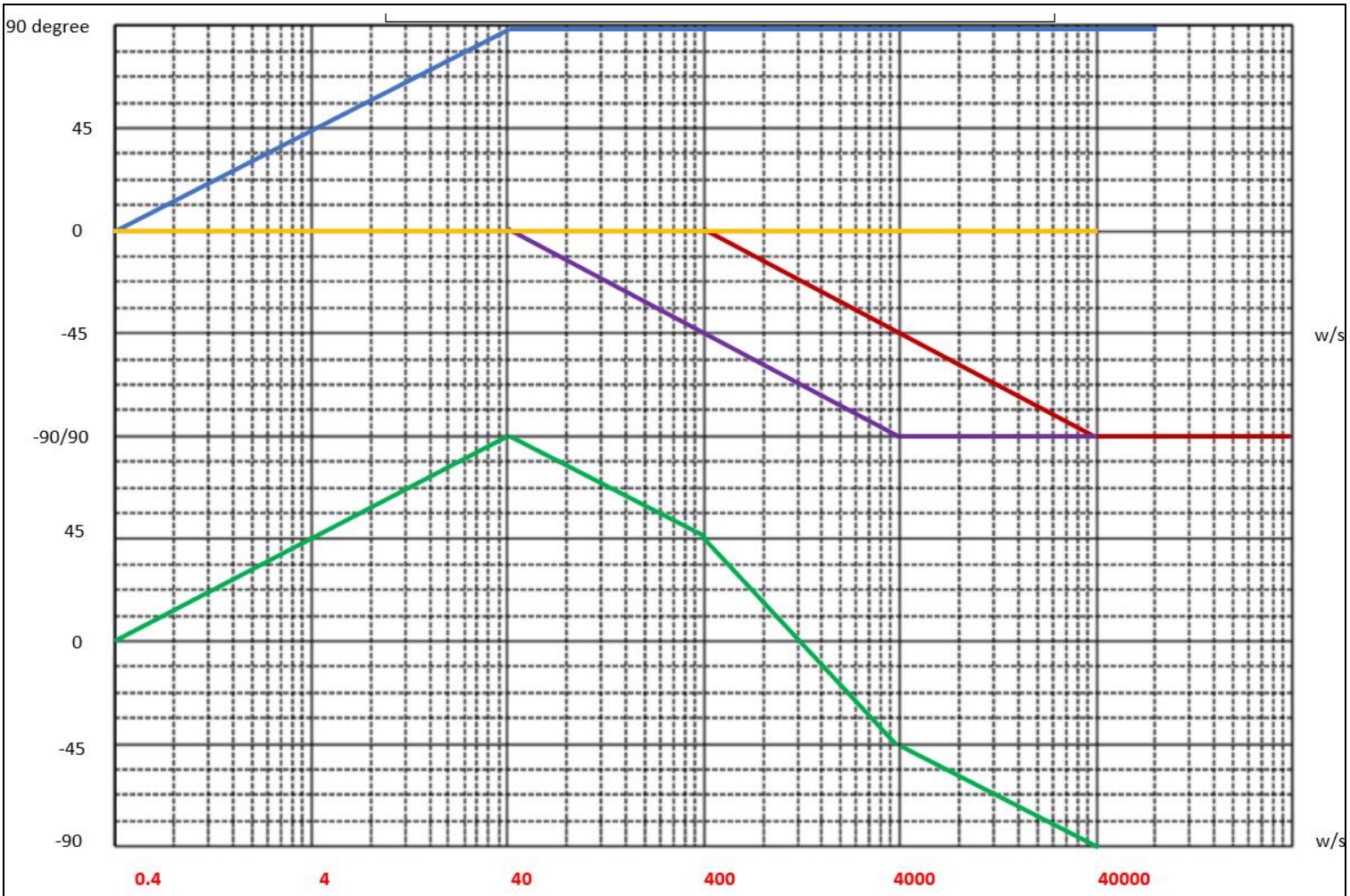
Q-3 Draw Straight line Bode diagram for Amplitude and Phase. **(40 points)**

Draw on Semi log sheet and show both individual and combined results.

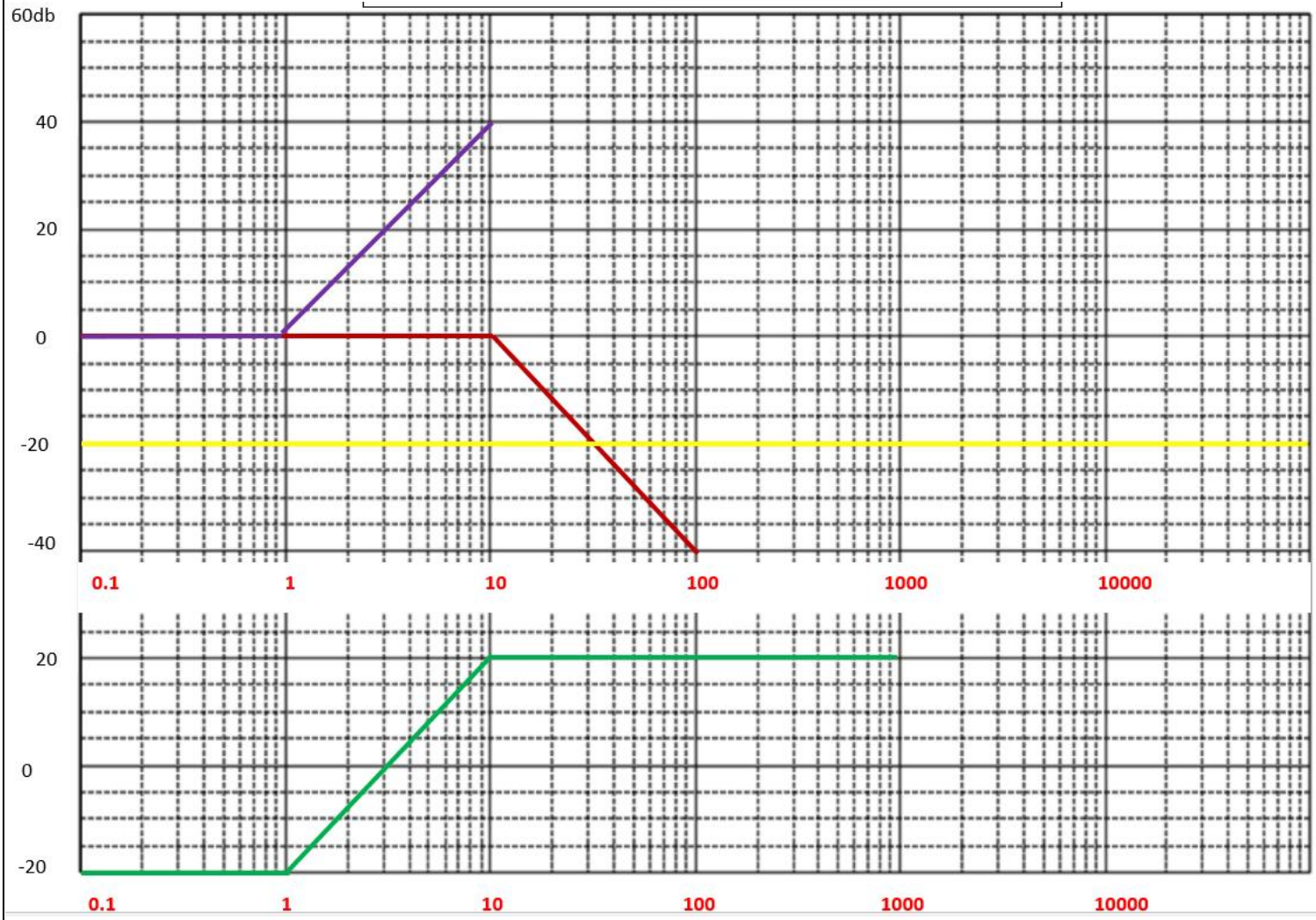
(Ignore damping effect)

a) $H(s) = \frac{40000(s+4)}{(s+400)(s+4000)} = \frac{0.1(1+\frac{s}{4})}{(1+\frac{s}{400})(1+\frac{s}{4000})}$




90 degree
45
0
-45
-90/90
45
0
-45
-90
w/s
w/s
0.4
4
40
400
4000
40000

b) $H(s) = \dfrac{10(s^2 + 2s + 1)}{(s^2 + 5s + 100)} = \dfrac{0.1(1+\frac{s}{1})^{\wedge}2}{1+\left(\frac{s}{10}\right)^2+0.5(\frac{s}{10})}$




90 deg
45
0
-45
90
45
0
-45
-90
x 2
-180
0.1
1
10
100
1000
10000