PRINT YOUR NAME HERE:

HONOR CODE PLEDGE: "I have neither given nor received aid on this exam, nor have I concealed any violations of the honor code." Closed book; 4 sides of 8.5×11 "cheat sheet."

SIGN YOUR NAME HERE:

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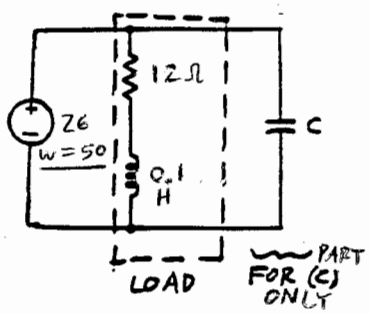
(20) 1. A voltage source $26\cos(50t)$ is connected to a small motor modelled by a 12Ω resistor in series with a $0.1H$ inductor.

(05) a. Compute the current $i(t)$ passing through the motor.

(05) b. Compute the average power dissipated in the motor.

(10) c. Compute the capacitor which, connected in *parallel* with the motor, corrects its power factor to one.



WRITE YOUR ANSWERS HERE:

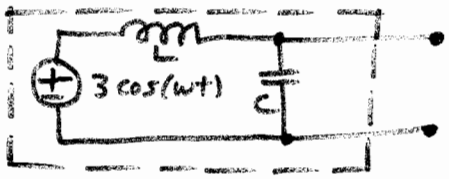
(a): $i(t) =$ **(b):** $\bar{P} =$ **(c):** C=

---

(10) 2a. Draw the Thevenin and Norton equivalents of You need to compute all 3 of V_{OC}, I_{SC}, Z_{EQ}.

(05) 2b. To what is the circuit equivalent for $\omega = 0$?

(05) 2c. To what is the circuit equivalent for $\omega = \frac{1}{\sqrt{LC}}$?



WRITE YOUR ANSWERS HERE:

THEVENIN **NORTON** **(2b)** **(2c)**

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(10) 3a. A signal $V_I(t) = 6 + 9\sqrt{2}\cos(3t) + 20\cos(4t)$ is input into a system with transfer function $H(j\omega) = 3/(j\omega + 3)$. Compute the output $V_O(t)$.

(05) 3b. Draw a circuit having this $H(j\omega)$. Use a 1Ω resistor and a capacitor.

(05) 3c. A system has transfer function $H(j\omega) = A/(j\omega + B)$ for *unknown* A, B. Its response to $V_I(t) = 3 + \cos(6t)$ is $V_O(t) = 1 + C\cos(6t - 45^o)$. Compute A, B, C.

WRITE YOUR ANSWERS HERE:

(a): $V_O(t) =$ **(b):**

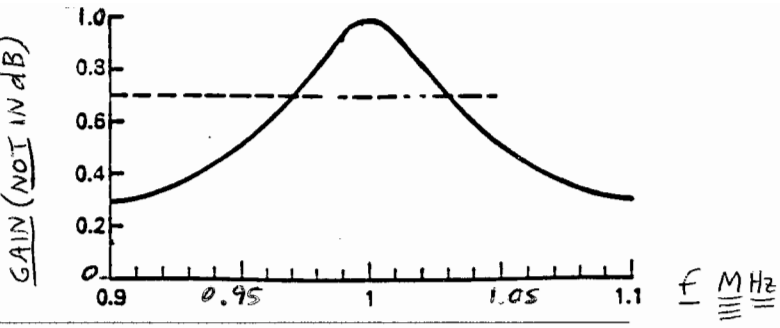
(c): $A =$ $B =$ $C =$

(20) 4. A series RLC has transfer function (the output is the resistor voltage).

(05) a. Determine Q from the figure.

(10) b. Compute L and C if $R = 20\Omega$.

(05) c. At what two frequencies is the magnitude=-60 dB? Hint: slopes.

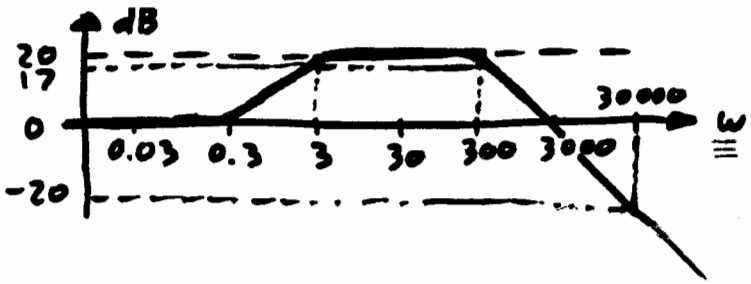


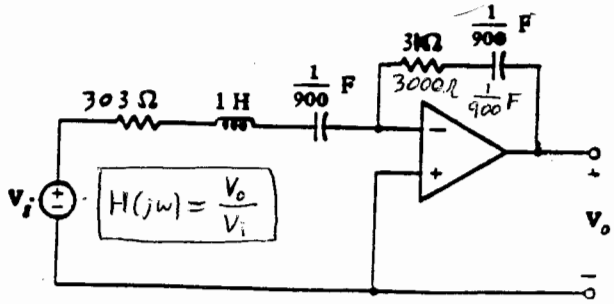
WRITE YOUR ANSWERS HERE:

(a): Q= **(b):** L= C= **(c):** f_1 = f_2 =

20 (10) 5a. For the Bode magnitude plot below left, compute $H(j\omega)$. **Simplify your answer.**

(10) 5b. For the ideal op-amp circuit below right, compute $H(j\omega)$. **Simplify your answer.**





WRITE YOUR ANSWERS HERE:

(a): $H(j\omega) =$ **(b):** $H(j\omega) =$

#1:
#2:
#3:
#4:
#5:
$\sum$:

DO NOT WRITE HERE ↑