Fundamentals of Electrical Engineering (EEL 101)

Minor Test #1

Time: 1 hour **Max.marks 20**

1. Consider the circuit shown in Fig. 1. Determine the voltage V_o, using Thevenin's Theorem. (5)

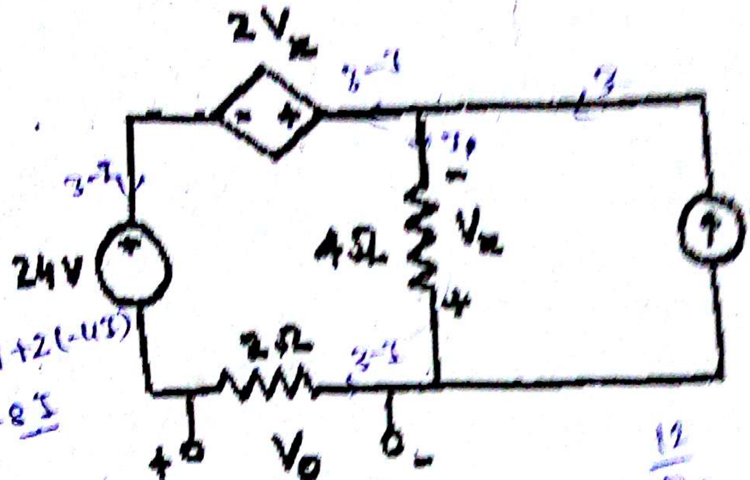

Fig.1

$V_x = -4I$

$-4I + (3-I)2 + 24 + 2(-4I)$

$-4I + 6 - 2I + 24 - 8I$

$14I = 30$

$I = \frac{30}{14}$

$3 - \frac{30}{14}$

$\frac{42-30}{14}$

$\frac{12}{7}$

2. In the circuit of Fig.2, L=2 H, R_1=10 Ω, R_2 = 8 Ω and C=(1/8)F. The initial conditions are given by $v_c(0)$ = 1V and $i_L(0)$ = (1/2)A.

   (a) Obtain the "homogeneous" differential equation governing the system, in terms of $v(t)$, and the "characteristic" equation.

   (b) Will the response be under, over or critically damped?

   (c) Solve for $v(t)$ and evaluate all constants from initial conditions, and plot it approximately. (6)

$e^{-3t} + 6te^{-3t}$

PTO

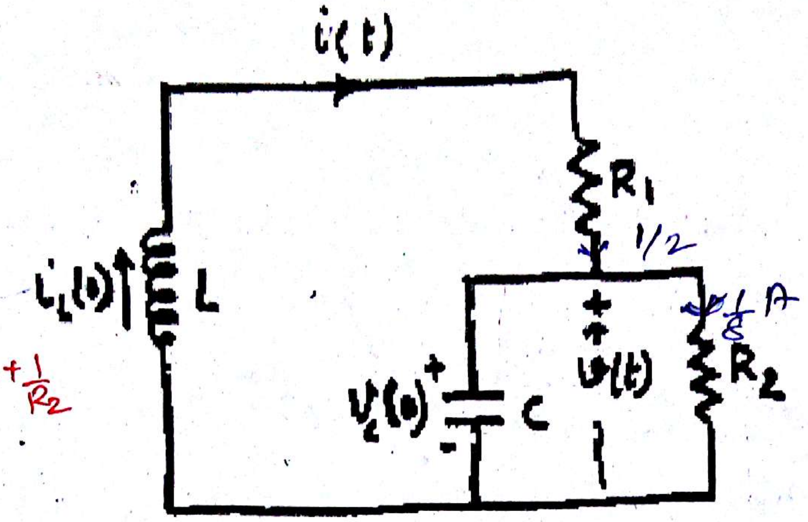

Fig.2

$\frac{1}{sL+R_1} + sC + \frac{1}{R_2}$

3. In the Circuit of Fig. 3, we have $\underline{I} = 8\angle 0°A, \underline{V} = 60\angle 90°V, \underline{Z} = 10\angle 90°\Omega$. Replace $\underline{V}$ and the 10-Ω resistance by a Norton Equivalent and predict I_Z. Write the expression for this current as a function of time, given that both the sources generate signals at a frequency of 1000 radians/sec. (5)

$10\angle -53°$

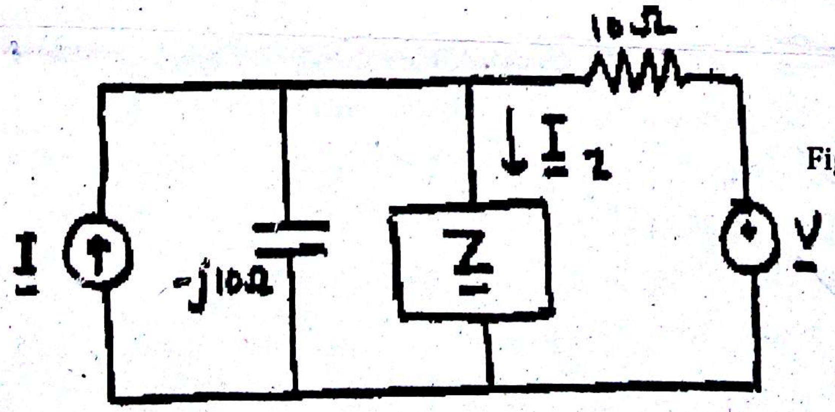

Fig.3

4. Obtain the generic form of the natural response v(t) of the system of Fig. 2 by using the pole-zero plot of an appropriately identified impedance or admittance function. Do not evaluate the constants (coefficients of the exponentials) here. (4)