ELECTRICAL ENGINEERING DEPARTMENT

EEL202 CIRCUIT THEORY

MAJOR 19/11/2015 13:00-15:00 PM MM:45

Q1. Solve the following simultaneous differential equations assuming that the system is initially at rest.

$$2x'(t)+3x(t)+y'(t)+6y(t)=\delta(t) \qquad x'(t)+x(t)+y'(t)+6y(t)=u(t)$$

In particular, obtain homogenous and particular solutions, the initial conditions at $t=0+$ and the values of the constants based on the initial conditions. (6)

Q2. For the network shown in Fig.1, assuming $L_1L_2=M^2$, obtain expressions for $I_1(s)$ and $I_2(s)$. Also determine expressions for $i_1(0+)$ and $i_2(0+)$ using initial value theorem. (6)

Q3. For the network shown in Fig.2, the switch is closed at $t=0$. Determine $i_1(t)$ and $i_2(t)$ at $t=0-$ and at $t=0+$. Also, determine their derivatives at $t=0+$. (5)

Q4. Determine the y-parameters of the network shown in Fig.3, assuming that α is non zero. Express alpha in terms of y_{12} and y_{21}. (5)

Q5. Determine if $Y(s)=\dfrac{2s^3+2s^2+3s+2}{s^2+1}$ is PR. If it is PR, then realize it. (5)

Q6. Realize $Z(s)=\dfrac{(s+2)(s+4)}{(s+1)(s+5)}$ in Foster-I and Foster-II forms. (5)

Q7. Realize $Y_{21}(s)=\dfrac{Ks}{s^3+3s^2+4s+2}$ using zeros of transmission method and determine the value of K so realized. (5)

Q8. Realize $\dfrac{V_2}{V_1}=\dfrac{s+2}{s+3}$ using a constant-resistance network. (4)

Q9. Determine if the polynomial $f(\omega)=\omega^8-\omega^4-2\omega^2+2$ is positive for all ω. (4)

PTO for figures

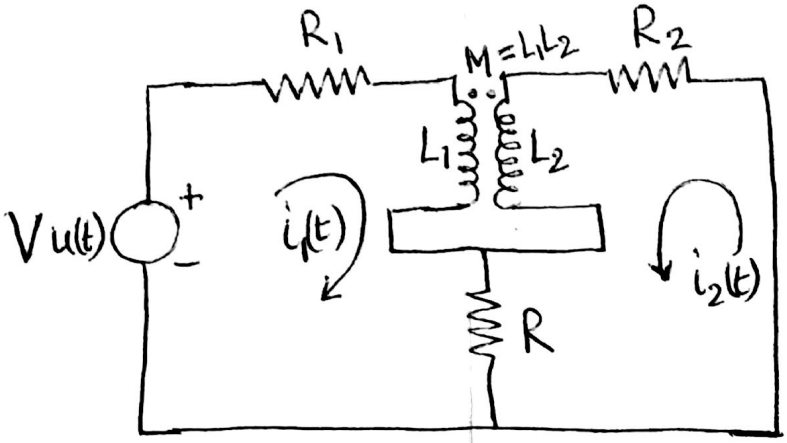

Fig. 1

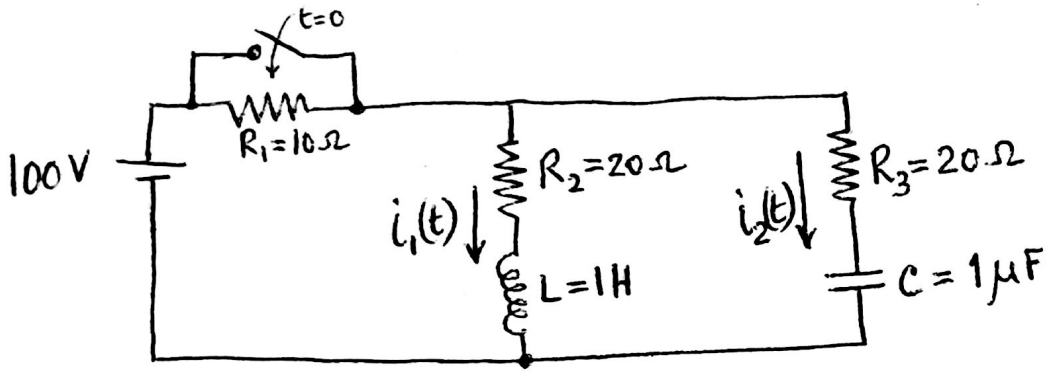

Fig. 2

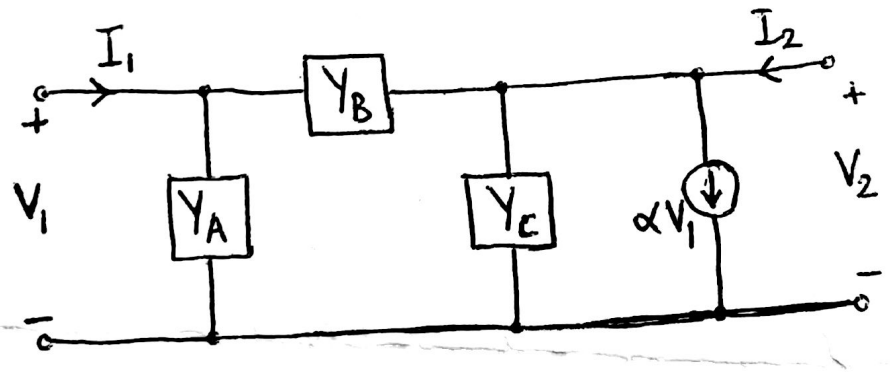

Fig. 3