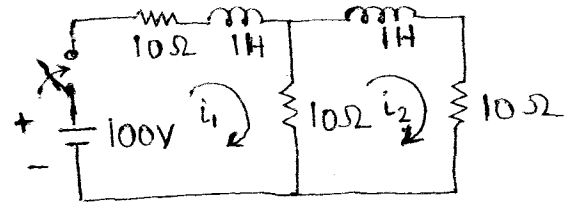


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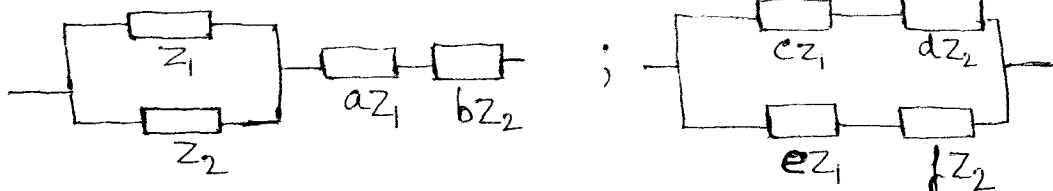
Indian Institute of Technology, Kharagpur

Date FN/AN, Time 2 Hrs. Full marks 30. Deptt E&ECE, No of Students 114. Mid Autumn Semester Examination, Sub. No. EC21005, Sub. Name Network Theory 2nd Yr. B.Tech, Instruction Answer All questions, Figures on the margin indicate marks.

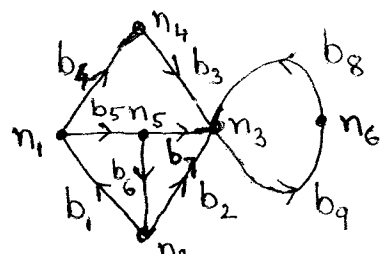
Q1. For the network shown the switch is closed at $t=0$. Find the current $i_2(t)$ as a function of time. (3)



Q2. Find the values of c, d, e and f in terms of a, b when the two networks are degenerate. (3)

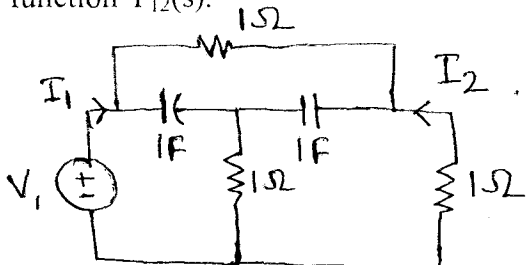


Q3. a) For the graph shown write down the augmented incidence matrix (2)



b) Prove the Tellegen's theorem starting from Kirchoff's current law. Hence show that for a single port network composed of R, L and C elements has $\text{Re } Z(s) \geq 0$ for $\text{Re } s \geq 0$. All symbols have the usual meaning. (1+2)

Q4. For the Bridge-T network shown write down the driving point admittance function and the transfer function $Y_{12}(s)$. (4)



Q5. A two terminal capacitor has some initial charge stored in it. Will it be always passive? Explain (1)

Q6. Find the Impulse and step response of the system $H(s) = \frac{10}{s^2 + 6s + 10}$ (3)

Q7. Find the convolution $x(t) = e^{-at} \cdot u(t)$ and $h(t) = u(t)$. (2)

Q8. Check for linearity and time variance of the given system

$$y(t) = t^2 \cdot \frac{d^2 x(t)}{dt^2} + t \cdot \frac{dx(t)}{dt} + 3. \quad (2)$$

Q9. Find the fourier transform of the signal $x(t) = e^{-|t|}$. (2)

Q10. Explain Bode plots with first order and second order systems as examples. Draw the Bode magnitude plot of given system.

$$G(S) = \frac{s}{(1 + 0.5s)(1 + 0.12s + 0.04s^2)} \quad (5)$$