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# 328314(28)

## B. E. (Third Semester) Examination, April-May 2021

**(Old Scheme)**

**(AEI, CSE, EI, ET&T & IT Engg. Branch)**

**NETWORK ANALYSIS and SYNTHESIS**

***Time Allowed : Three hours***

***Maximum Marks : 80***

***Minimum Pass Marks : 28***

***Note :*** *Part (a) of every question is compulsory of 2 marks each. Attempt any* ***two*** *from part (b), (c) and (d) of 7 marks each.*

**1.** (a) Define initial and final value theorem. Solve the below problem :

$$F(s) = \frac{5s+3}{s(s+1)}$$ for initial value. 2

(b) In the circuit shown, the switch $K$ is opened at $t = 0$. At $t = 0+$, calculate $v$, $dv/dt$ and $d^2v/dt^2$.

If $I = 10\ \text{A}$, $R = 1000\ \Omega$, $C = 1\ \mu\text{F}$. 7

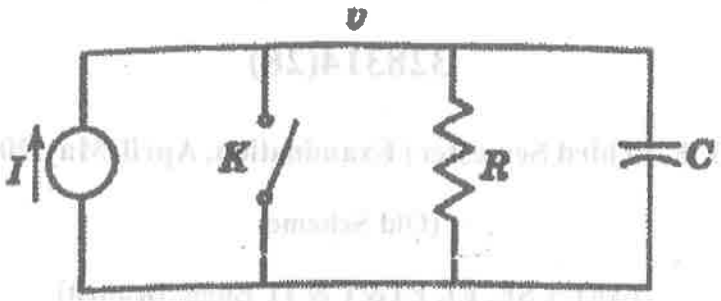


Fig. (1)

(c) At $t = 0$, a switch is closed, connecting a voltage source $V = V \sin \omega t$ to a series $RL$ circuit given below. By the method of Laplace transformation, show that the current is given by the following equation : 7

$$i(t) = \frac{V}{Z} \sin(wt - \phi) + \frac{wLV}{Z^2} e^{-Rt/L}$$

where $Z = \sqrt{R^2 + (wL)^2}$ and $\phi = \tan^{-1} \frac{wL}{R}$

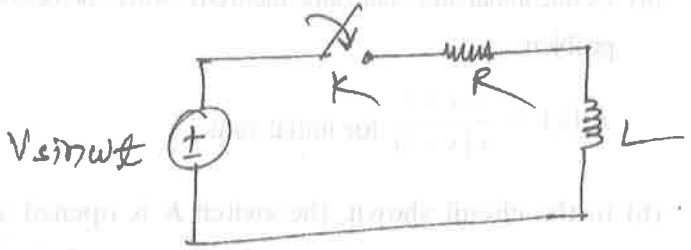


Fig. (2)





(d) In the network shown, the voltage source follows the law $v(t) = ve^{-\alpha t}$, where is a constant. The switch is closed at $t = 0$, 7

(i) Solve for the current assuming that $\alpha = R/L$

(ii) Solve for the current assuming that $\alpha \neq R/L$

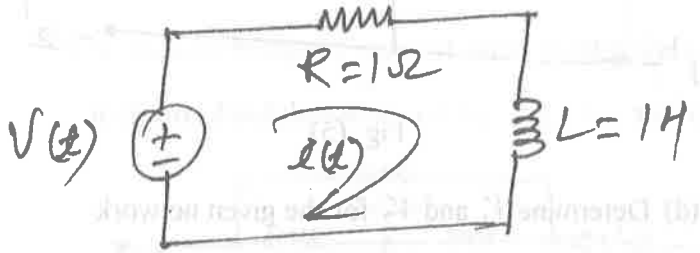


Fig. (3)

**2.** (a) Write down the formula for conversion of $z$ parameters in terms of $h$ parameter. 2

(b) Find out the $Y$ and $Z$ parameters for the given network : 7

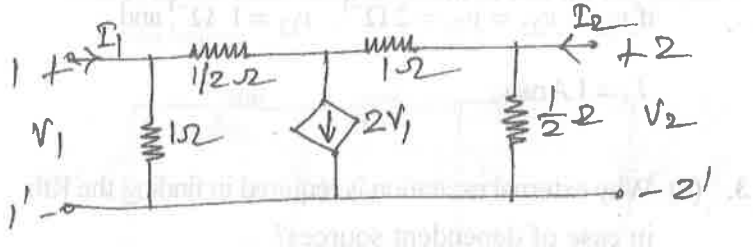


Fig. (4)

(c) For the figure shown find the value of $h$ parameter : 7

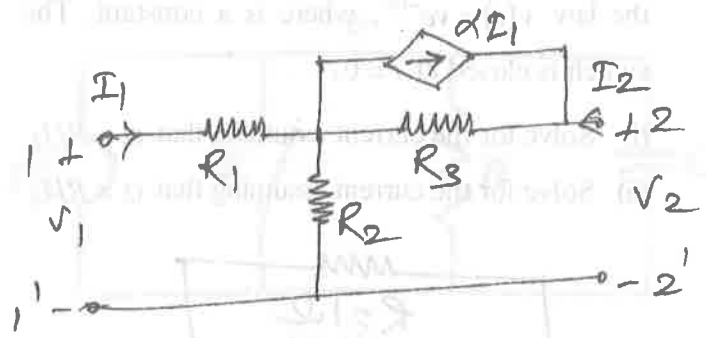


Fig. (5)

(d) Determine $V_1$ and $V_2$ for the given network

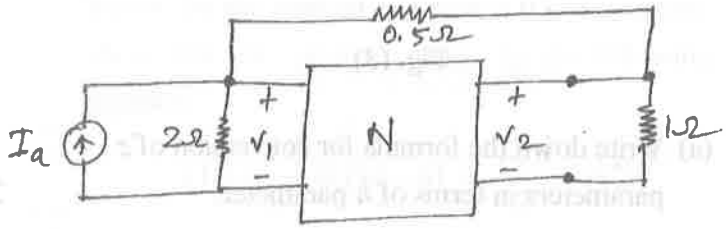


Fig. (6)

if $y_{11} = y_{22} = y_{21} = 2\ \Omega^{-1}$, $y_{12} = 1\ \Omega^{-1}$ and

$I_a = 1$ Amp. 7

**3.** (a) Why external excitation is required in finding the Rth in case of dependent sources? 2





(b) For the network shown, find out the equivalent Thevenin's network : 7

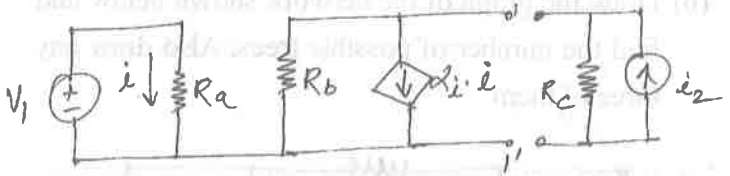


Fig. (7)

(c) A resistive bridged $T$ network (two-port) is shown in figure. Find the values of $G_{12}$, $Z_{12}$, $Y_{12}$ and $\alpha_{12}$. 7

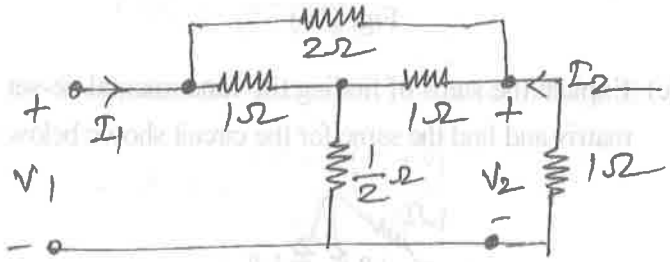


Fig. (8)

(d) Find the value of $RL$ for maximum power transfer as well as the value oof maximum power for the circuit given below. 7

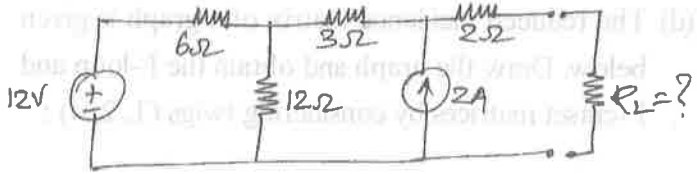


Fig. (9)

**4.** (a) Define tree and co-tree. 2

(b) Draw the graph of the network shown below and find the number of possible trees. Also draw any three of them. 7

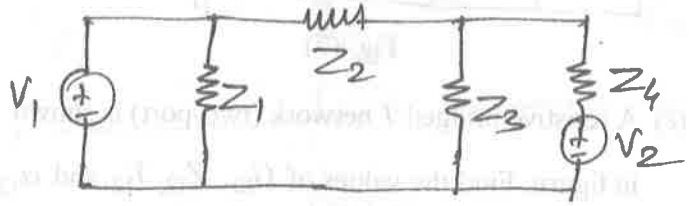


Fig. (10)

(c) Explain the steps of finding the fundamental tie-set matrix and find the same for the circuit shown below : 7


Fig. (11)

(d) The reduced incidence matrix of a graph is given below. Draw the graph and obtain the F-loop and F-cutset matrices by considering twigs (1, 2, 4) : 7





$$A = \begin{array}{c} \\ a \\ b \\ c \end{array} \begin{array}{c} \begin{array}{ccccccc} 1 & 2 & 3 & 4 & 5 & 6 & 7 \end{array} \\ \begin{bmatrix} 0 & 0 & 1 & 1 & 1 & 0 & -1 \\ 0 & 1 & 0 & 0 & -1 & 1 & 1 \\ -1 & 0 & -1 & 0 & 0 & -1 & 0 \end{bmatrix} \end{array}$$

**5.** (a) What are the conditions for a function to be P. R. F.? 2

(b) Test whether the following polynomial is Hurwitz or not? Find the condition if any. 7

$$F(s) = \frac{s+a}{s^2+bs+c}$$

(c) Synthesize the network in Foster form I and II. 7

$$Z(s) = \frac{\left(s^2+1\right)\left(s^2+9\right)}{s\left(s^2+4\right)}$$

(d) Synthesize the network in Cauer form I and II. 7

$$Z(s) = \frac{s^4+10\,s^2+9}{s^2+4\,s}$$