53 (IE 301) NWTH

2016

NETWORK THEORY

Paper : IE 301

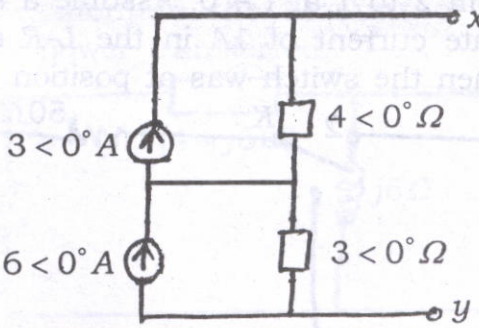
Full Marks : 100

Time : Three hours

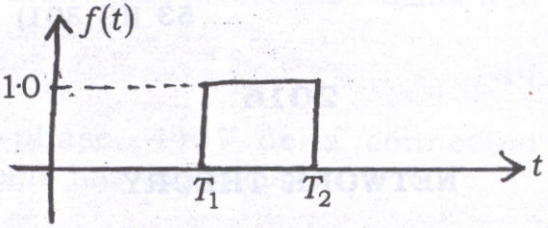
The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

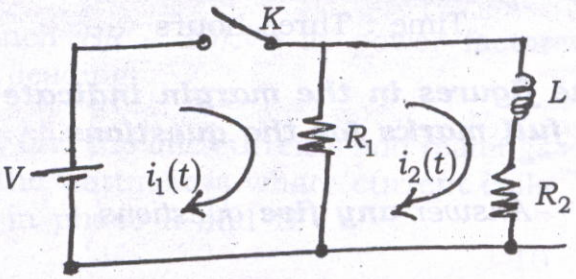
1. *(a)* Convert the following current source circuit to a single voltage circuit. 6



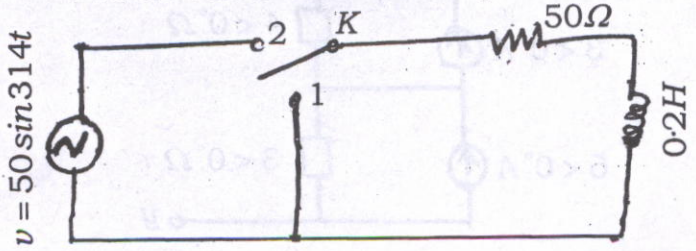
(b) Obtain the Laplace transform of the pulse shown in following *fig.* 6



(c) A two mesh network is shown below. Obtain the expression for $I_1(S)$ and $I_2(S)$ when the switch is closed. 8

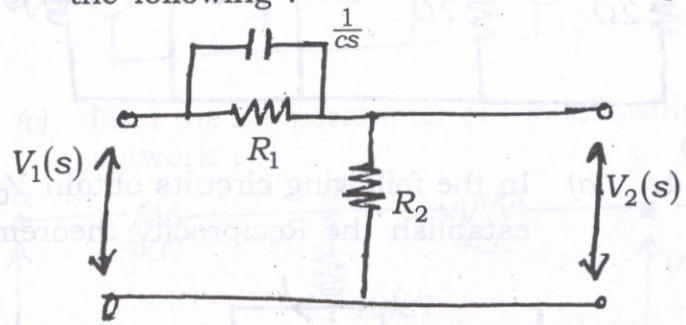


2. (a) Obtain the current at $t > 0$; if a.c. voltage 'v' is applied when switch 'K' is moved from 2 to 1 at $t = 0$. Assume a steady state current of 1A in the L–R circuit when the switch was at position 1. 7



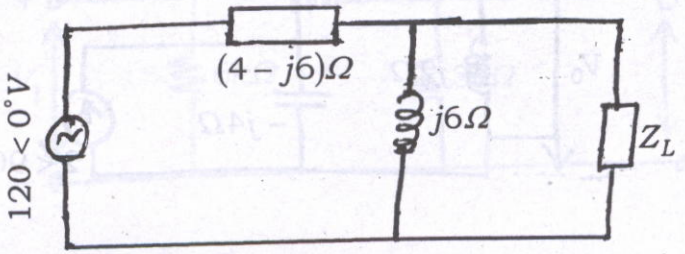
(b) Calculate the time taken by a capacitor of $2\mu F$ and in series with $2M\Omega$ resistance to be charged upto 60% of its final value. 5

(c) Obtain the Transfer Function $\frac{V_2(s)}{V_1(s)}$ in the following : 8

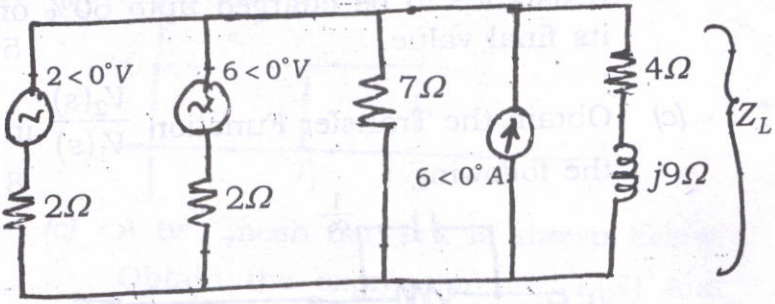


3. (a) A function is given by $Z(s) = \left(\frac{3s}{s^2+16}\right)$. Draw its pole-zero plot. 6

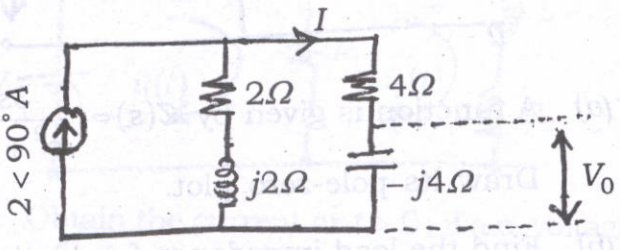
(b) Find the load impedance for maximum power transferred to the load. Also calculate the amount of maximum power transferred. 7

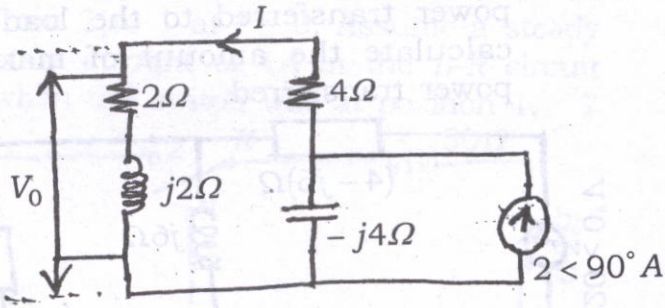


(c) Using Millman's Theorem, find the current through Z_L. 7

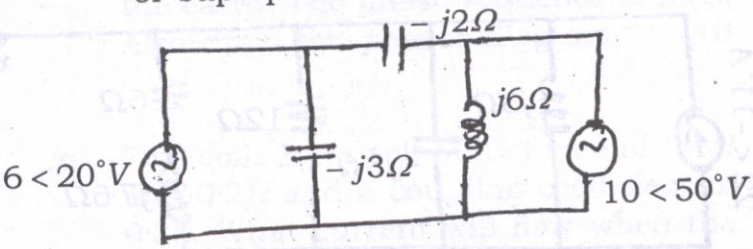


4. (a) In the following circuits obtain V_0 and establish the Reciprocity theorem. 8

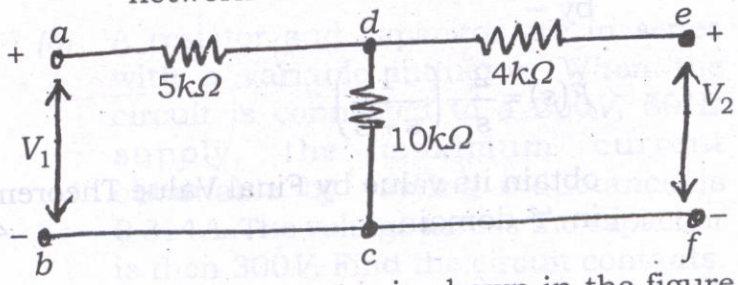




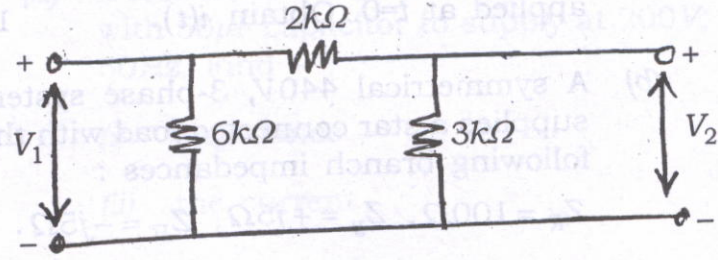
(b) Find the current through $j5\Omega$ inductive reactance using the principle of superposition. 6



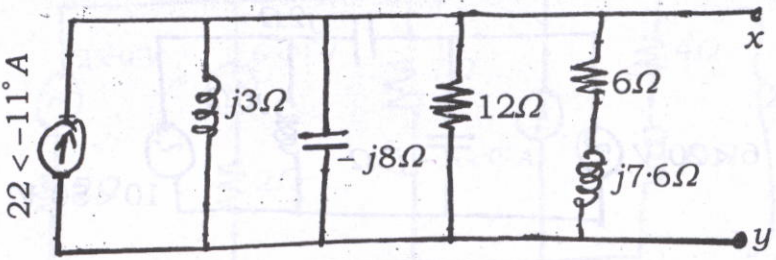
(c) Find the Z – parameter of the following network : 6



5. (a) A π–attenuator is shown in the figure. Find the Y–parameters and draw equivalent Y–parameter circuit. 8



(b) Find the Thevenin's equivalent circuit to the left of the terminals x and y : 8



(c) A function in Laplace domain is given by –

$$F(s)=\frac{2}{s}-\left(\frac{1}{s+3}\right)$$

obtain its value by Final Value Theorem in 't' domain. 4

6. (a) In a series RLC circuit $R=6\Omega$, $L=2H$ and $C=3F$. A dc voltage of $30V$ is applied at t=0. Obtain $i(t)$. 10

(b) A symmetrical $440V$, 3-phase system supplies a star connected load with the following branch impedances :

$Z_R=100\Omega$, $Z_y=+j5\Omega$, $Z_B=-j5\Omega$.

Calculate the voltage drop across each branch and potential of the neutral to the earth. The phase sequence is *RYB*. Also draw the phasor diagram. 10

7. *(a)* Two coils have self inductance of $0{\cdot}1H$ and $0{\cdot}2H$ and a coupling coefficient of 0·35. What current will flow when the coils are joined in series across a $125V$, $50Hz$ circuit ? 10

(b) A resistor and capacitor are in series with a variable inductor. When the circuit is connected to a $200V$, $50Hz$ supply, the maximum current obtainable by varying inductance is $0{\cdot}314A$. The voltage across the capacitor is then $300V$. Find the circuit contants. 10

8. *(a)* A resistor of 100Ω is connected in series with $50\mu F$ capacitor to supply at $200V$, $50Hz$. Find –

(i) impedance

(ii) the current

(iii) the power factor

(iv) the phase angle, and

(v) the voltage across the resistor and capacitor.

10

(b) A 3–phase, 440*V* delta connected systems has the loads :

Branch *RY* – 20*kW* at power factor 1

Branch *YB* – 30*kVA* at power factor 0·8 (lagging)

Branch *BR* – 20*kVA* at power factor 0·6. (leading)

Now find the line currents and readings on the wattmeters whare current coils are in phase *R* and *B*.

10
