

CIRCUITS AND TRANSMISSION LINES

Q.P. Code: 27027

[Time:3 Hours]

[Marks:80]

N.B

1. Question No.1 is compulsory.
2. Attempt **any three** questions from remaining five questions.
3. Assume **suitable data** if required.
4. Use **Smith chart** for the transmission line problem if asked.

Q.1)(a) Find the Norton's equivalent circuit across the terminal a-b for the circuit shown in

Figure No.1.

(5-M)

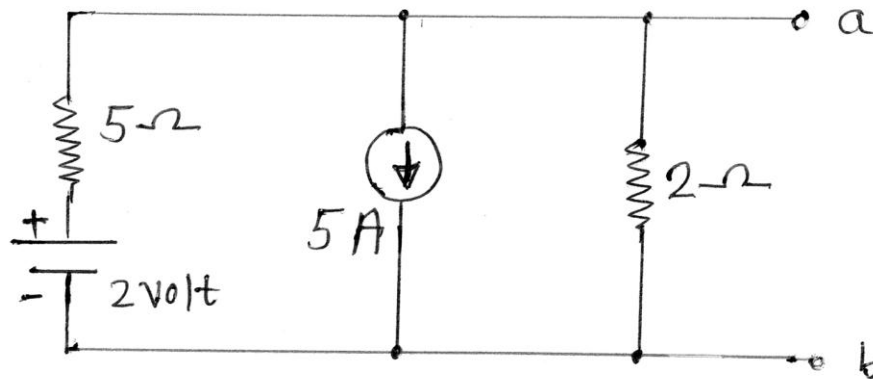


Figure No.1

(b) Obtain the instantaneous value of currents through R and L and obtain the total current in terms of RMS value for the circuit shown in Figure No.2. This circuit is energized by a sinusoidal a.c. voltage of $v = 100\sin(1000t+36)$ volt.

(5-M).

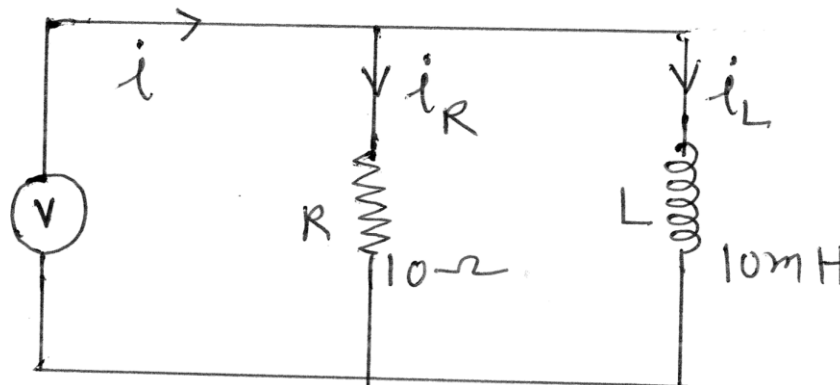


Figure No. 2

(c) Determine the Z- parameters for the circuit shown in Figure No.3.

(5-M)

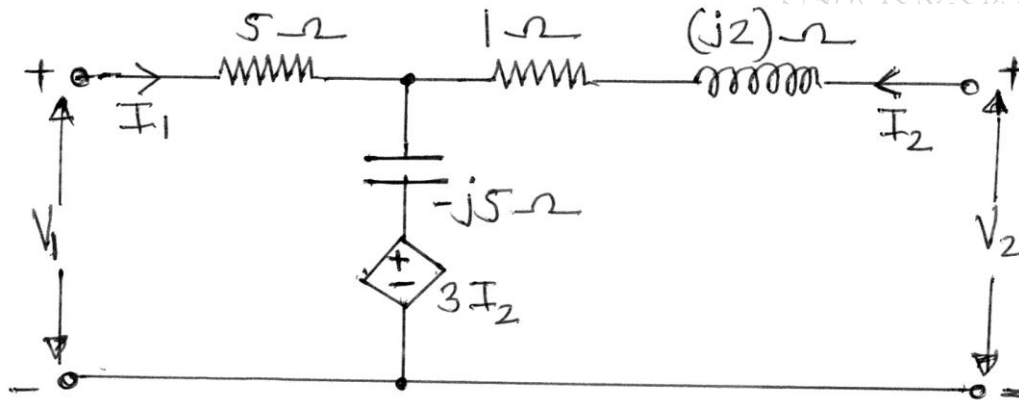


Figure No. 3

(d) Differentiate between lossy transmission line and lossless transmission line with respect to (i) Equivalent circuit (ii) Propagation constant (iii) Attenuation constant (iv) Characteristics impedance (v) Input impedance.

(5-M)

Q.2) (a) Find the transmission parameters for the circuit shown in Figure No.4 (10-M)

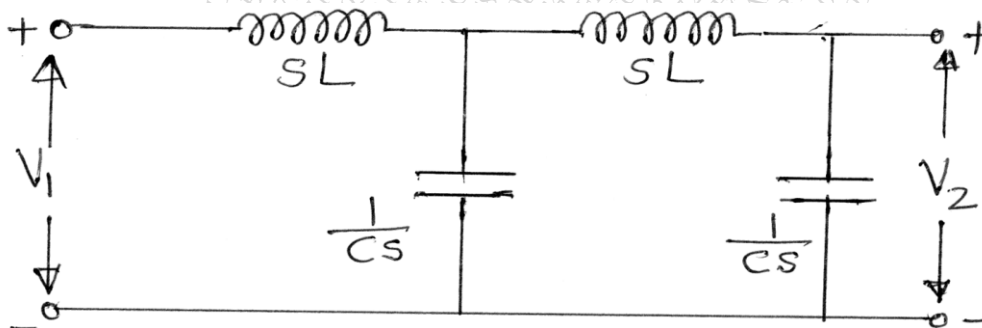


Figure No. 4

(b) For network shown in Figure No.5, the switch is opened at $t = 0$, find $v(t)$ for $t > 0$. (10-M)

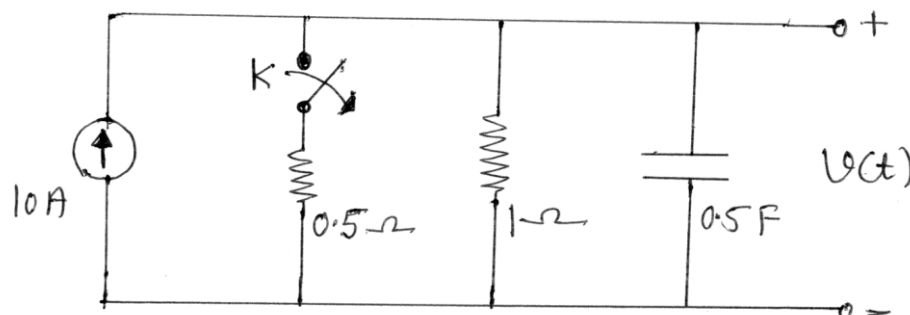


Figure No. 5

Q.3) (a) Find the Thevenin's equivalent circuit for the network shown in Figure No.6 at the right of the terminal a-b. (10-M)

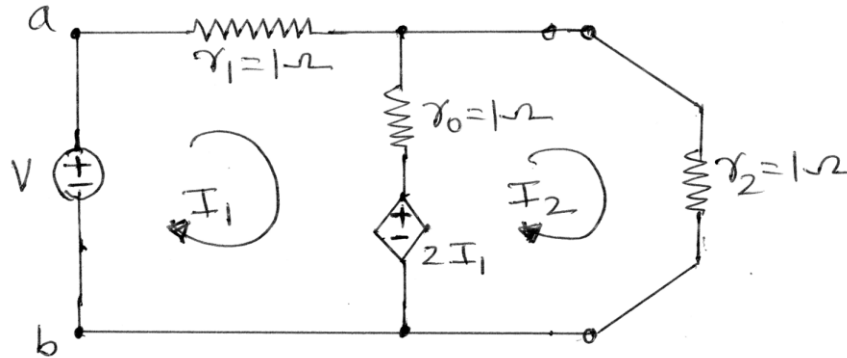


Figure No. 6

(b) A series RC combination, having an impedance of $Z_L = (450 - j600) \Omega$ at 100 MHz, is connected to a 300Ω transmission line. Calculate in meters the position and length of short circuited shunt stub designed to match this load to the line. Give any one solution and solve using **Smith chart** only. (10-M)

Q.4) (a) A driving point impedance is given by $Z_{LC}(s) = \frac{s(s^2+4)(s^2+6)}{(s^2+1)(s^2+5)}$. Obtain the first form of Cauer network. (10-M)

(b) Find the voltage drop across the capacitor and the resistor for the circuit shown in Figure No.7. (10-M)

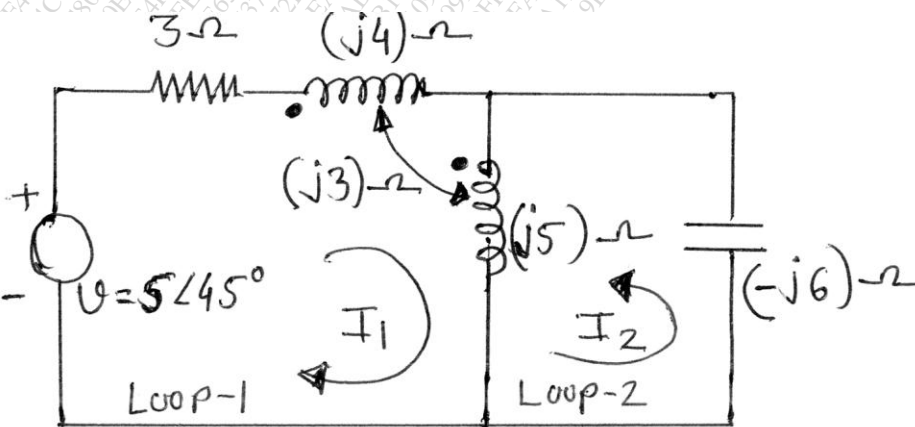


Figure No. 7

Q.5) (a) Find the Z parameters for the network shown in Figure No.8

(10-M)

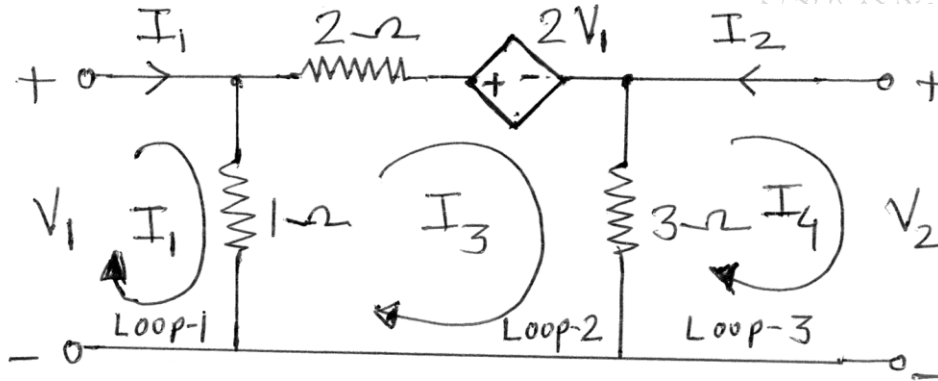


Figure No. 8

(b) (I) State properties of the positive real function (PRF).

(5-M)

(II) Check positive realness of the function $Y(s) = \frac{s^2 + 2s + 20}{s + 10}$ with proper reason.

(5-M)

Q.6) (a) Find $V_C(t)$ and $I_L(t)$ in the circuit shown in Figure No.9 assuming zero initial conditions.

(10-M)

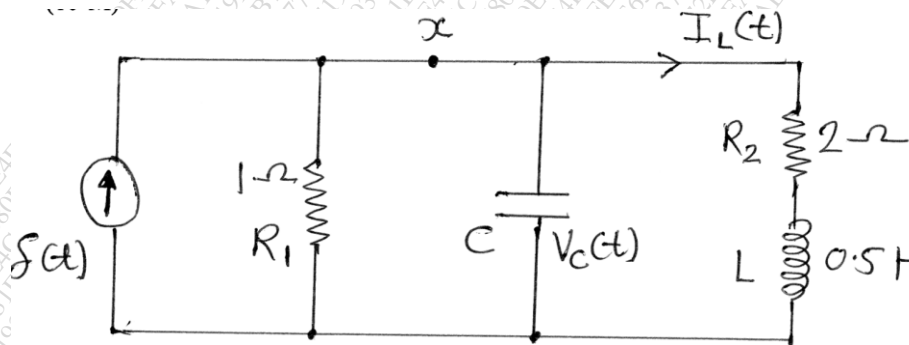


Figure No. 9

(b) A load impedance of $Z_L = (40 + j70) \Omega$ terminates 100Ω transmission line of length 0.3λ long. Use formulas and determine following parameters.

(10-M)

(i) Find load admittance at the load end of transmission line.

(2-M)

(ii) Find input impedance at the input port of transmission line.

(4-M)

(iii) Find reflection coefficient at the load end of transmission line.

(2-M)

(iv) Find voltage wave standing ratio (VSWR) along the transmission line.

(2-M)
