SE. (Sem-III) (BSGS) EXTC 22/12/2016

Circuits & Transmission Lines

**QP Code : 545602**

(3 Hours) **[ Total Marks : 80**

**N. B. :** (1) Question No. **1** is **compulsory**.
(2) Attempt any **three** questions from the remaining **five**.
(3) **Figures** to the **right** indicate **full** marks.
(4) Use Smith chart for transmission line problem.
(5) Assume suitable data if required.

1. (a) In the network shown in fig. (1), find the voltages $V_1$ and $V_2$. **5**

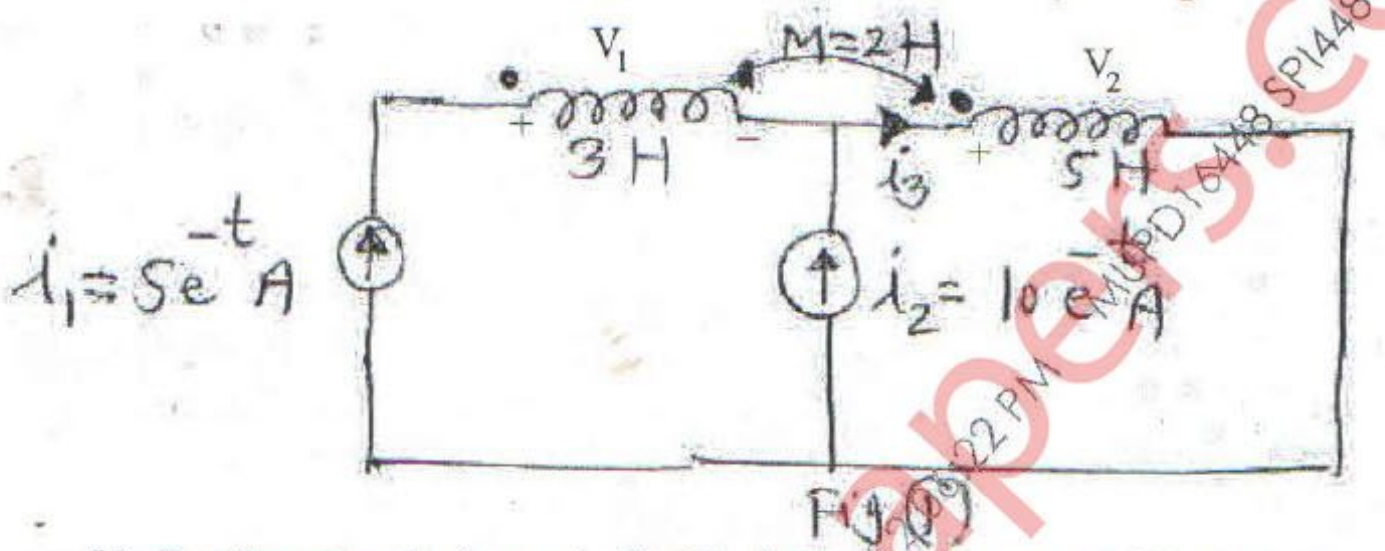



Fig (1)

(b) For the network shown in fig (2), determine the current i(t) when the switch is closed at t = 0 with zero initial conditions. **5**

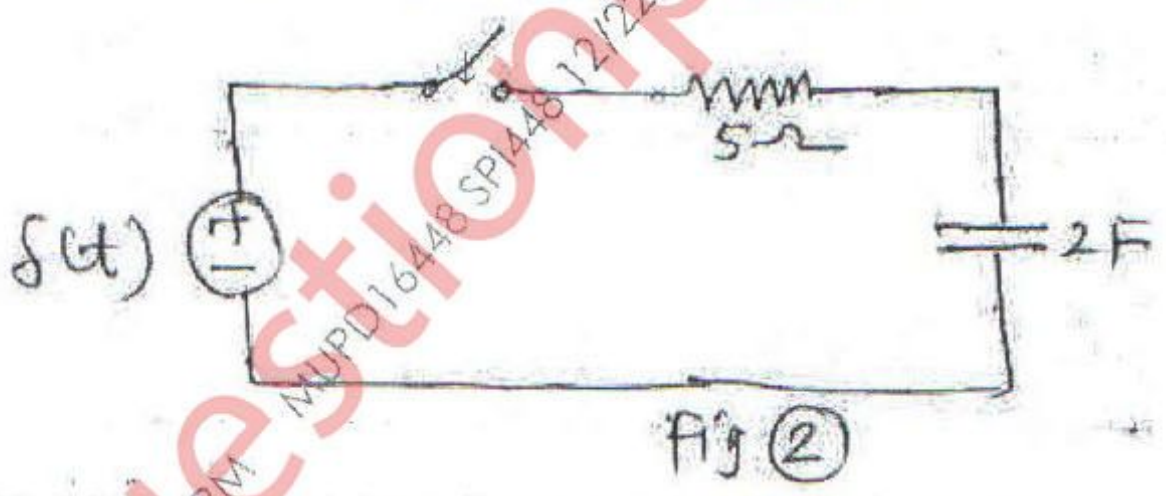



Fig (2)

(c) Find the lattice equivalent of symmetric π-network shown in figure (3). **5**

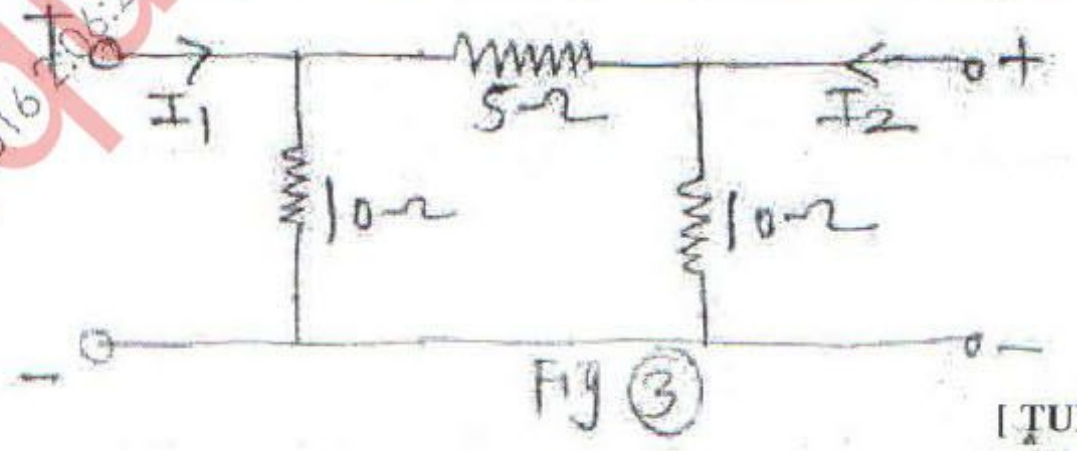



Fig (3)

**[ TURN OVER**

(d) Define the following parameters of transmission line. 5

(i) Input impedance
(ii) Characteristics impedance
(iii) VSWR
(iv) Reflection coefficient
(v) Transmission coefficient

2. (a) In the network shown in fig. (4) the switch closes at t = 0. The capacitor has no initial charge. Find $V_C(t)$ and $i_C(t)$. 10

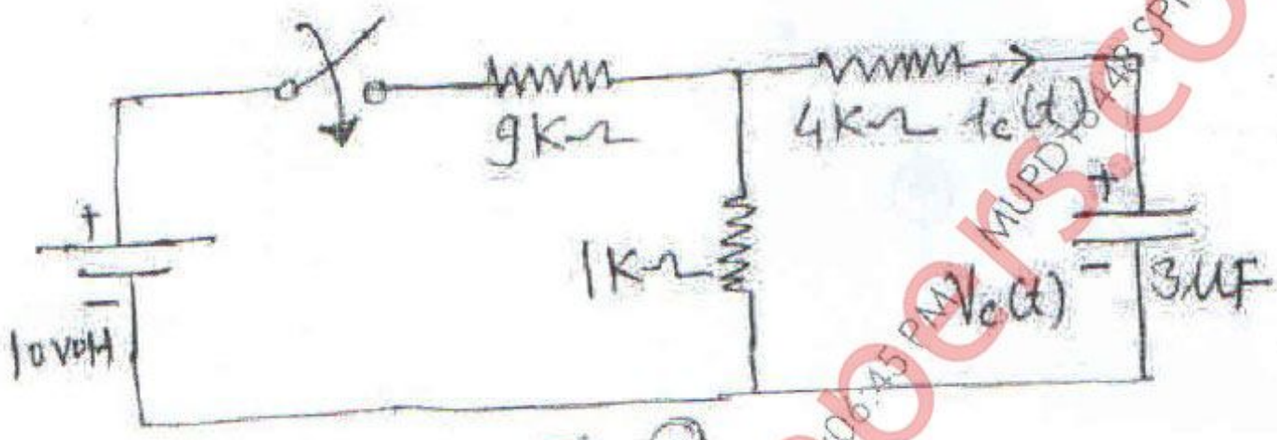



Fig (4)

(b) Determine the transmission parameters of the network shown in fig (5) using the concept of inter connection of two port network. 10

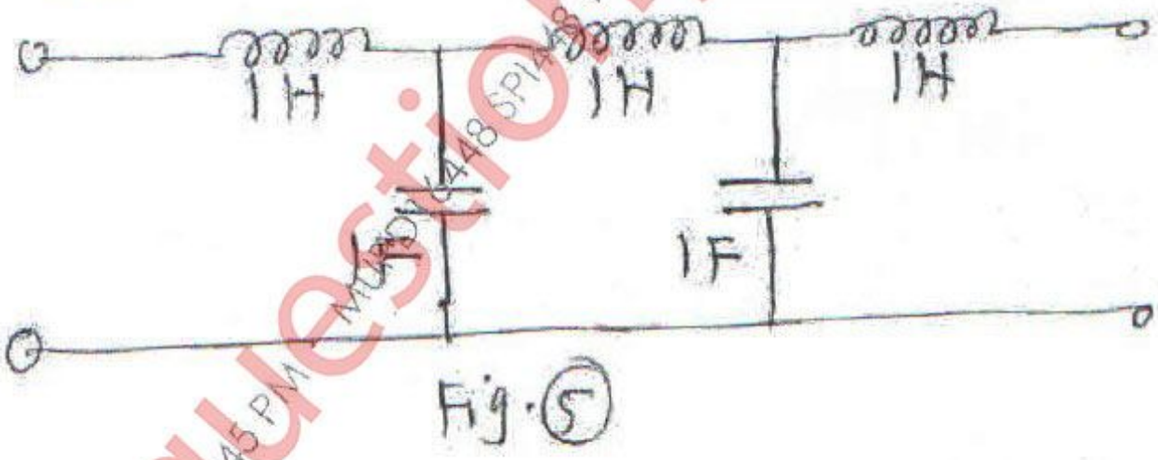



Fig. (5)

3. (a) For the network shown in fig (6), calculate the maximum power that may be dissipated in the load resistor $R_L$. **10**

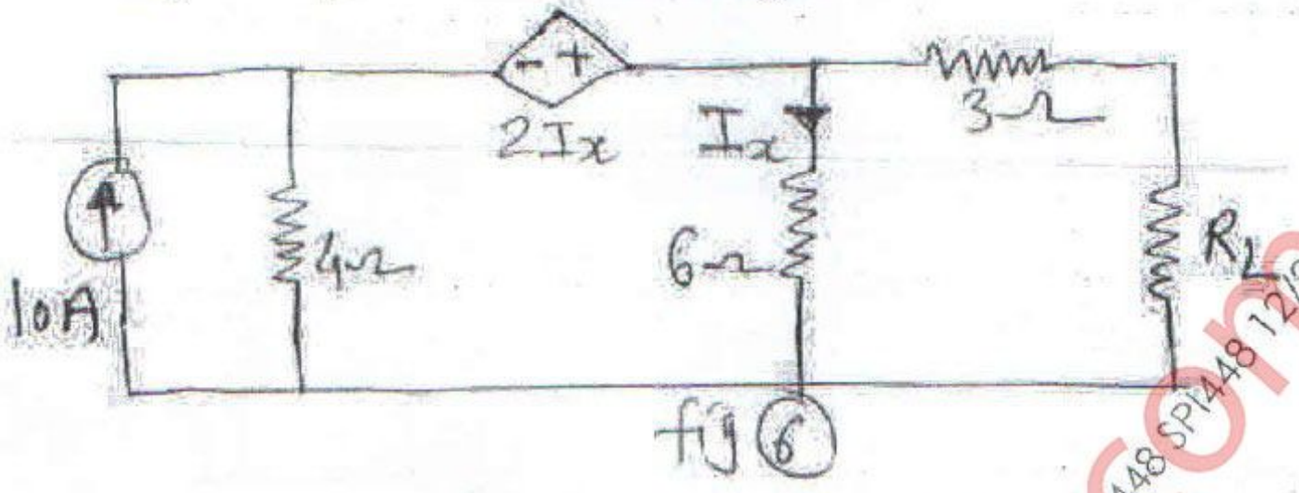



fig (6)

(b) A load impedance $Z_L = (30 + j60)\Omega$ is connected to a $50\Omega$ transmission line of 2 cm length and operated at 2 GHz. Using Smith Chart, find the imput impedance of transmission line under the assumption that phase velocity is 50% of speed of light. **10**

4. (a) An impedance is given by- **10**

$$Z(s) = \frac{8(s^2+1)(s^2+3)}{s(s^2+2)(s^2+4)}$$

Realise the network in Foster-I and Cauer-I form

(b) In the coupled circuit of figure (7), find the input impedance as well as the net inductance. **10**

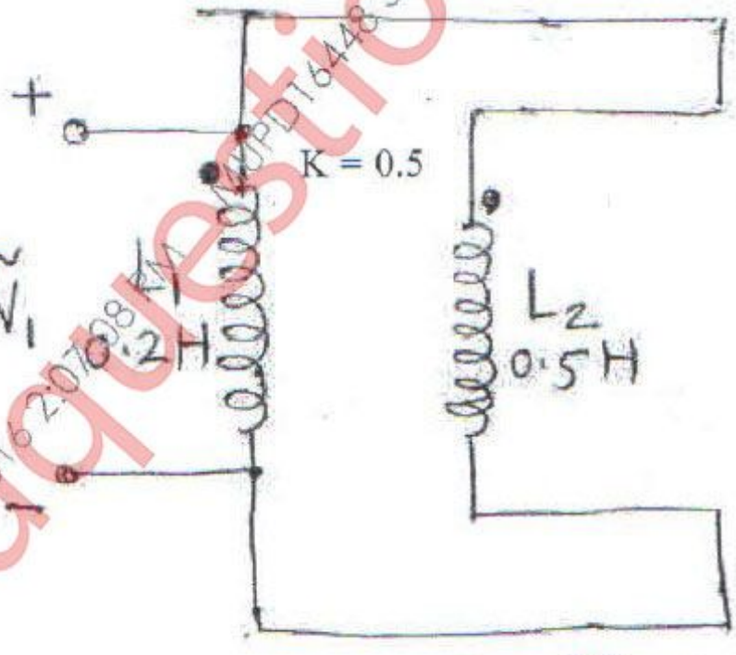
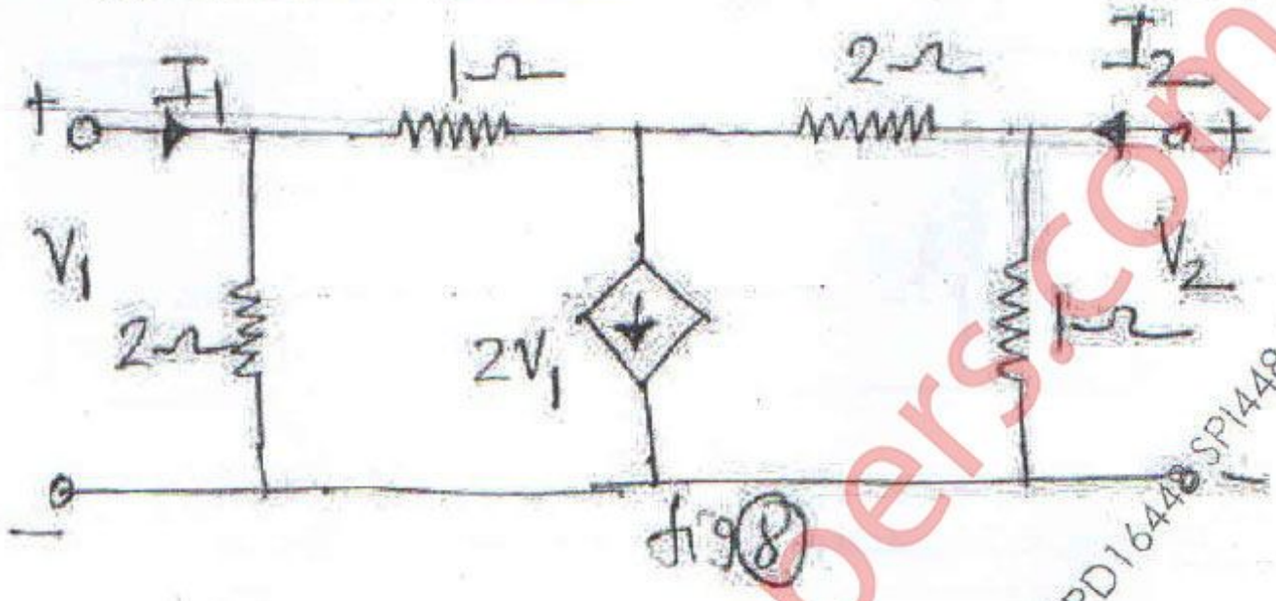



Fig (7)

5. (a) Find the open circuit impedance parameters of the circuit shown in fig. (8). Also find the Y parameters. **10**




(b) (i) State properties of LC driving point impedance functions. **5**

(ii) Test whether the polynomial is Hurwitz **5**

$P(s) = s^7 + 2s^6 + 2s^5 + s^4 + 4s^3 + 8s^2 + 8s + 4$

6. (a) A co-axial line has the following parameters: **10**

$R = 6\ \Omega/m$

$L = 5.2 \times 10^{-8}$ H/m

$G = 6 \times 10^{-3}$ mho/m

$C = 2.136 \times 10^{-10}$ F/m

$f = 1$ GHz

$Z_L = (100 + j\,100)\Omega$

Compute the following parameter using formulaes

(i) Characteristics impedance

(ii) Propagation constant

(iii) Reflection coefficient at the load

(iv) Transmission coefficient at the load

(b) In the network shown in fig (9), the switch is closed at t = 0. Find the current $i_1(t)$ and $i_2(t)$ when initial current through the inductor is zero and initial voltage is 4 volt. **10**

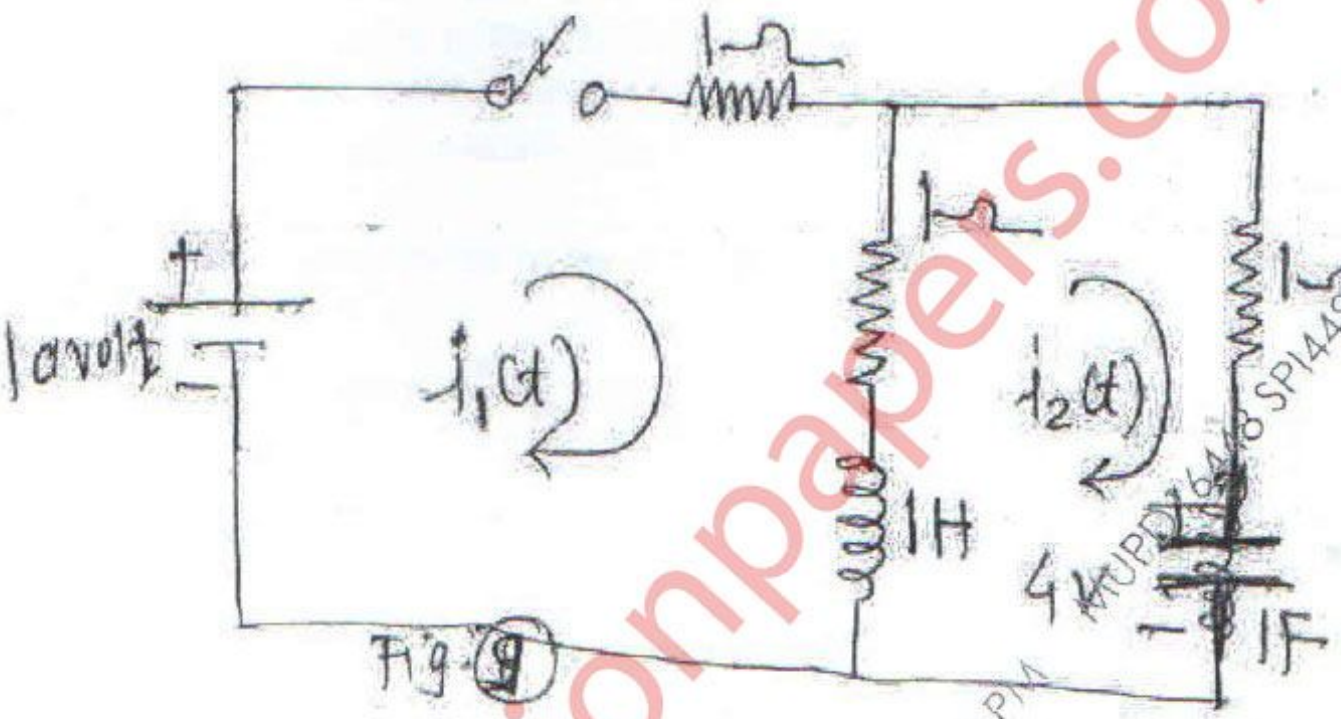



Fig (9)