S.E. EXTC (Sem 3) (CBGS), ckts & Tx. lines. 12/12/14

QP Code :14684

(3 Hours) [Total Marks :80

N.B. : (1) Attempt Ql and any 3 from the remaining questions. In all 4 questions are to be attempted.
(2) All sub-questions of the same question should be answered at one place only in their serial orders.
(3) Assume suitable data, if missing, with justification.

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1. (a) Prove that $F(s) = (s + \alpha)$, where a is a non-zero positive integer, is Hurwitz. Hence show that the polynomial $P(s) = (s + 6)^2 (s + 4)^6$ is also Hurwitz. 5
(b) State and prove Initial Value Theorem. 5
(c) Determine the ABCD parameters of the network shown in Fig. 1(c) considering the network as a cascade of two sub-networks. 5

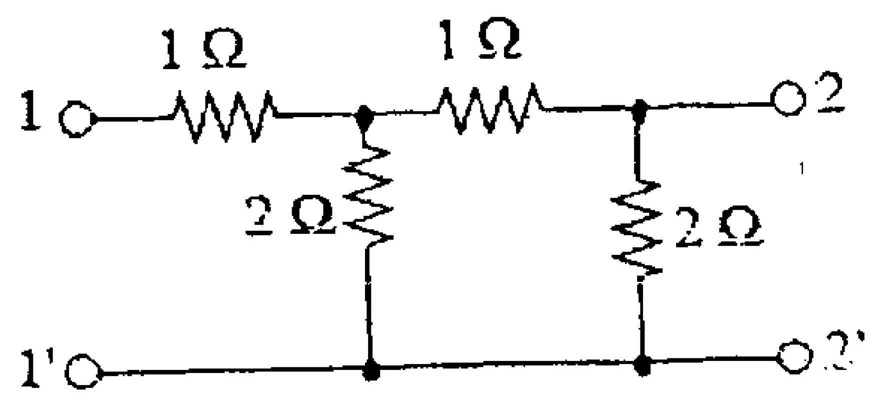

Fig. 1(c)

(d) Find Foster I and II, and Cauer I and II circuits for the driving point admittance $Y(s) = \dfrac{s^2 + 1}{s}$ Comment on your result. 5

2. (a) Find the value of the variable resistance R in the circuit shown in Fig. 2(a) such that the power delivered to the load resistance $R_L = 2$ ohm is maximum. 10

Evaluate the maximum value of the power.

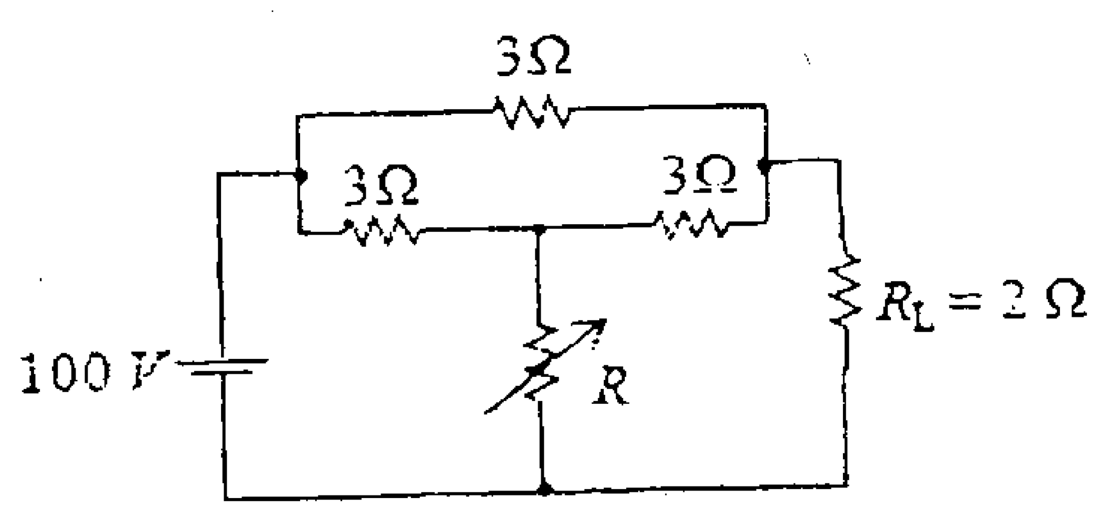

Fig 2(a)

(b) Two identical 2-port networks are connected in cascade. If the *y*-parameters of each network are $y_{11} = -y_{12} = -y_{21} = y_{22} = 10$ mho determine the *y*-parameters of the composite network. 5

(c) In the circuit shown in Fig. 2(c) find V_x. 5

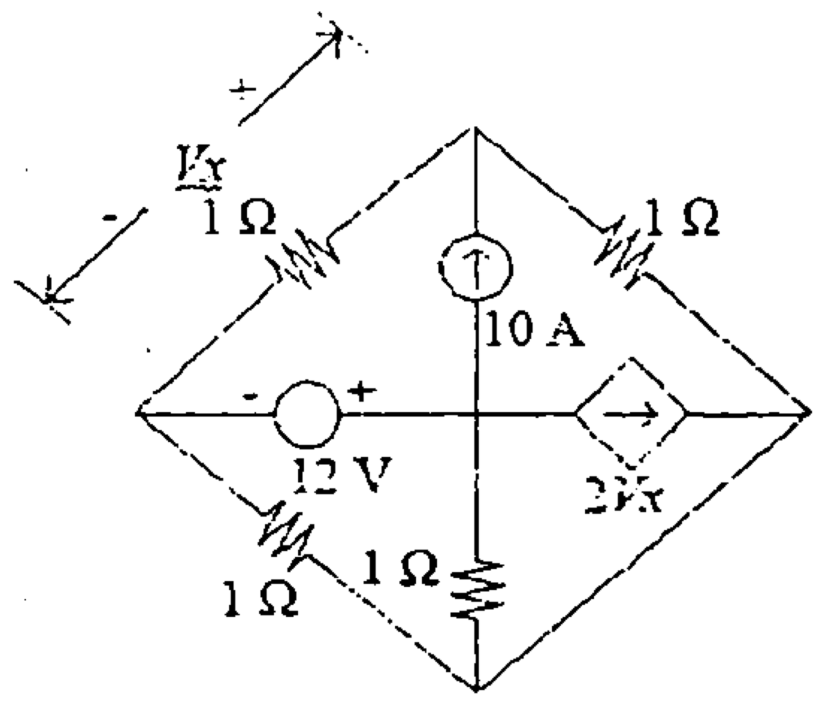

Fig 2(c)

3. (a) Test if $Z(s) = \dfrac{(s+1)(s+9)}{s(s+4)}$ represents a driving point impedance of an RL, RC or LC circuit. 10

Sketch $Z(\sigma)$ or $Z(\omega)$ curves whichever is applicable.

Find Foster II canonic circuit for the function.

(b) State and prove Final Value Theorem. 5

(c) The parameters of a transmission line are: 0.25 μ mho/km, 6 Ω /km, 2.2. mH/km, 005 μF/km. Find the characteristic impedance Z_0 and propagation constant γ at 1 kHz. 5

4. (a) Derive an expression for current I in the circuit shown in Fig 4(a) under the condition $\omega^2 LC = 0.5$ where ω is the radian frequency of the ac voltage V. Hence show that $|I|$ is independent of the impedance Z_R. 10

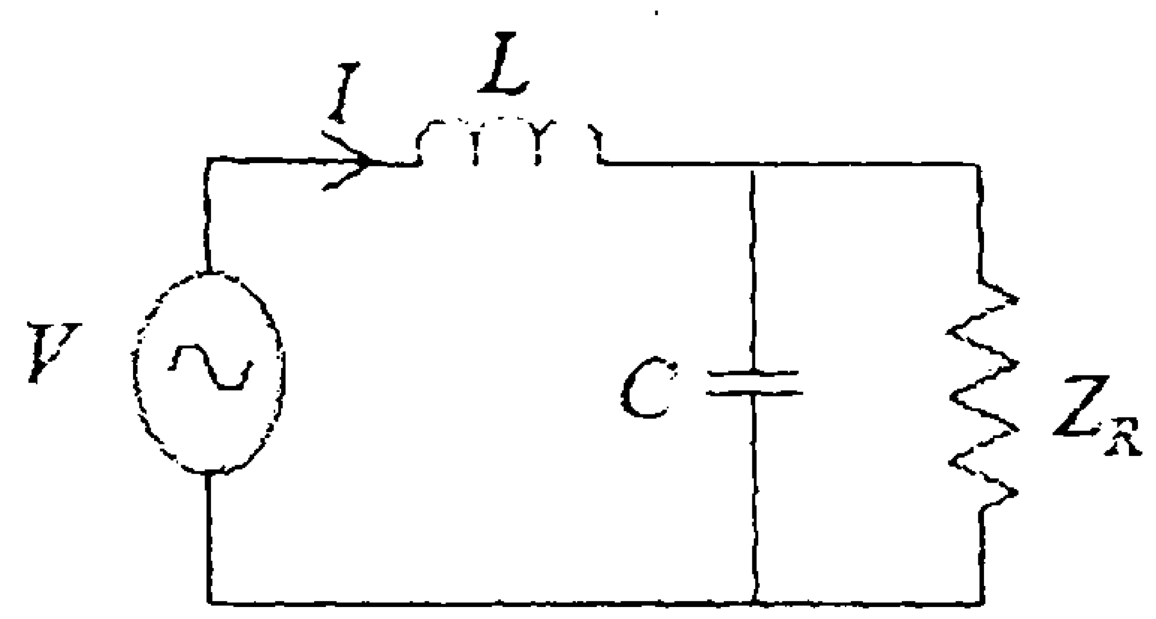

Fig 4 (a)

(b) Test if $F(s) = \dfrac{s^3 + 10s^2 + 27s + 18}{(s+1)(s+3)(s+5)}$ is a Positive Real Function. Realize the function as driving point impedance in Foster I form. 5

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(c) Determine V_2 for the network shown in Fig. 4(c) when $L = CR^2$ and V_1 is a pulse of height 10 V and width 1 s. **5**

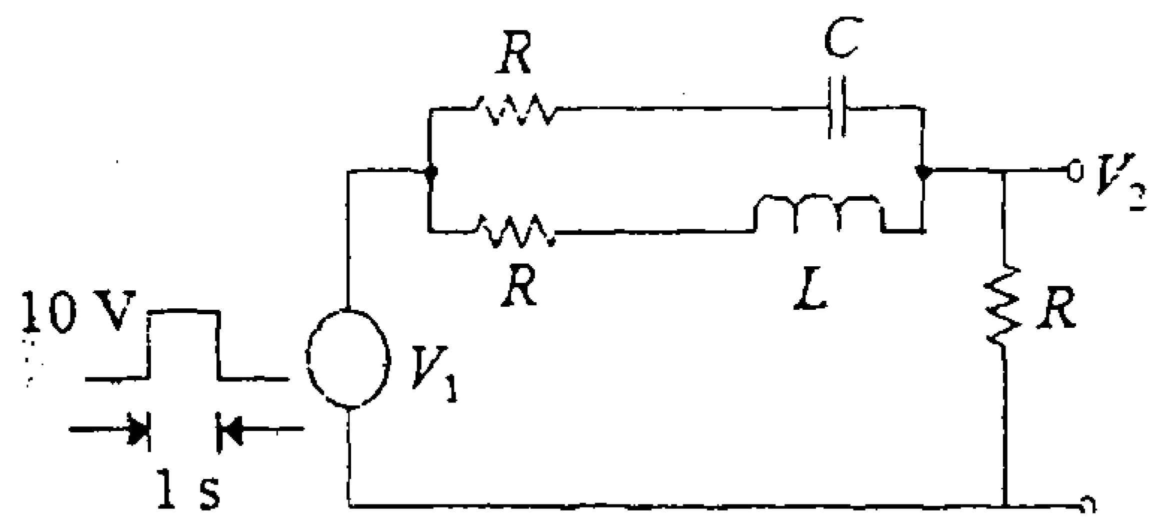

Fig 4 (c)

5. (a) A unit step voltage is applied to a circuit consisting of only passive elements (each has numerical value 1). The current supplied by the source is exponentially decreasing as shown in Fig. 5(a). Find the circuit with the minimum number of elements possible. **10**

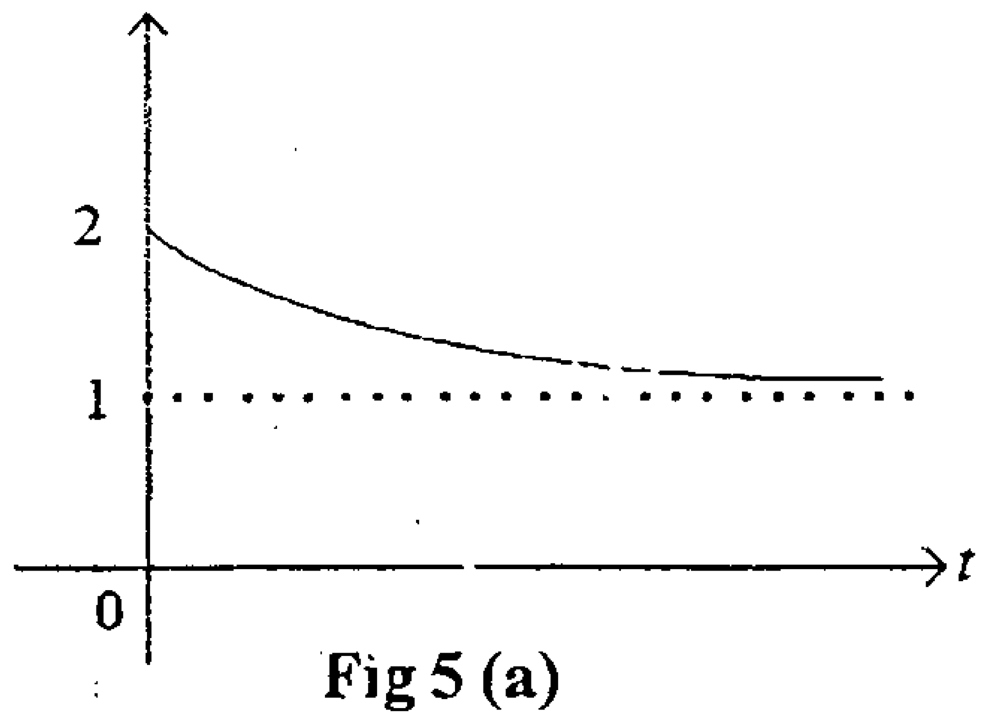

Fig 5 (a)

(b) Define and give the significance of the following . **5**
- (i) Characteristic impedance
- (ii) Propagation constant
- (iii) Reflection coefficient

(c) State the conditions for a reciproca 2-port network in terms of y-parameters and then convert it in terms of ABCD parameters. **5**

6. (a) Write a brief note on Smith chart under the following heads. **10**
- (i) VSWR circles
- (ii) Characteristics
- (iii) Applications

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