Time: 3 Hours **[Total Marks-80]**

N.B. **1. Question 1 is compulsory.**
2. Solve any three questions from remaining five.
3. Assume suitable data if necessary.
4. Figures to the right indicate full marks.

Q.1) a. Explain Reciprocity theorem with example. 5

b. Derive Unit impulse response of RC series circuit. 5

c. Test whether $P(s)= S^4+3S^2+5$ is Hurwitz. 5

d. Derive condition of symmetry for ABCD parameter. 5

Q.2) a. For oriented graph shown in fig (1), Obtain incidence matrix, fundamental tieset and fundamental cutset matrix. 10

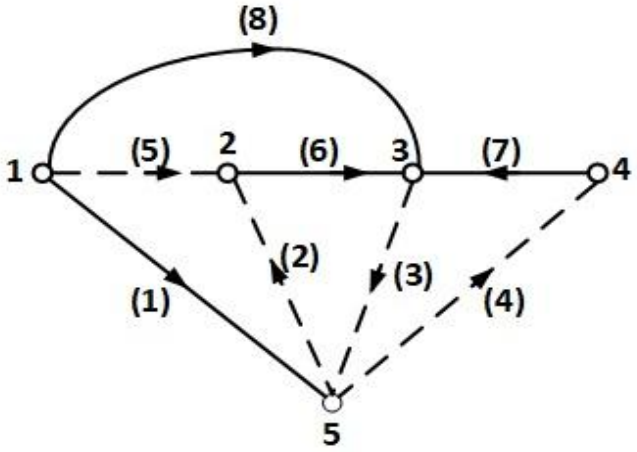

Fig. (1)

b. For network shown in fig. (2), determine voltage V_1 using Nodal analysis. 10

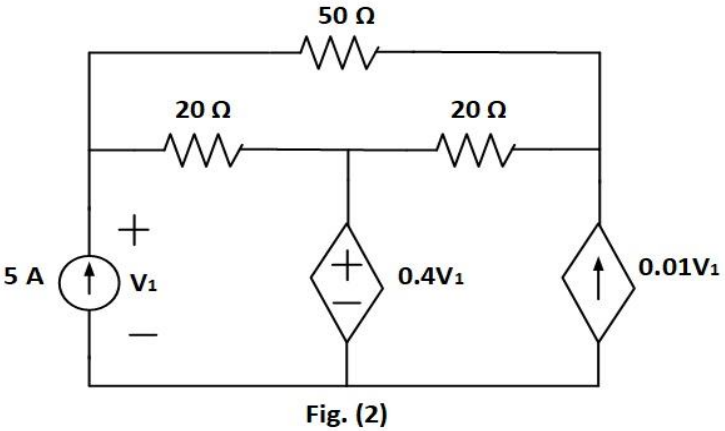

Fig. (2)

Q.3) a. In network shown in fig. (3), the switch is changed from position 1 to the position 2 at t=0, steady state condition having reached before switching. Find the values of i, di/dt and d^2i/dt^2. 10

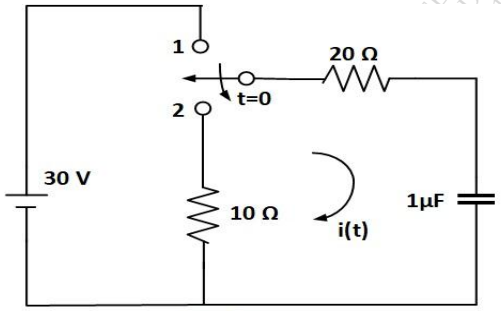

Fig. (3)

b. In network shown in fig. (4), a steady state condition is achieved with switch open. At t=0 switch is closed. Find $V_a(t)$. 10

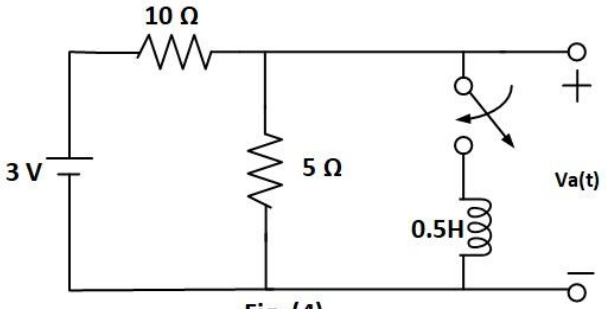

Fig. (4)

Q. 4) a. In network shown in fig. (5), the switch is moved from a to b at t=0. Using Laplace transform method, Determine i(t) and v(t). 10

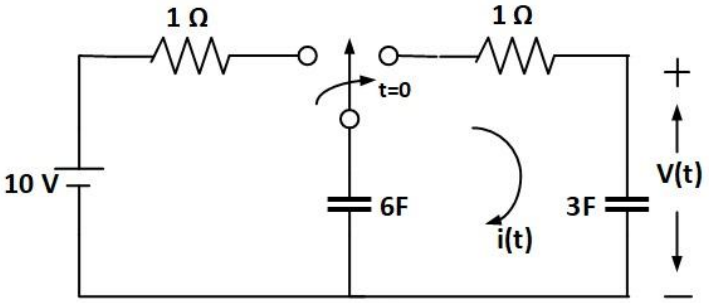

Fig. (5)

b. Find the value of load impedance Z_L for maximum power transfer in the network shown in fig. (6). Also find value of maximum power. 10

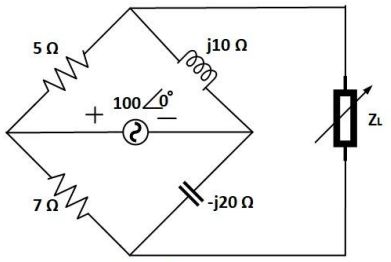

Fig. (6)

Q. 5) a. Determine voltage transfer function V_2/V_1 for network shown in fig. (7) 10

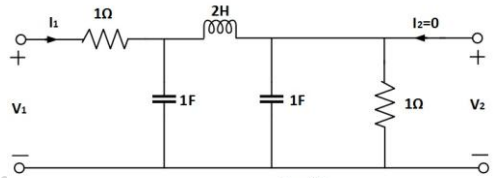

Fig. (7)

b. The pole zero diagram of the driving point impedance function and network are shown in fig. (8). At DC, the input impedance is resistive and equal to 2 Ω. Determine values of R, L and C. 10

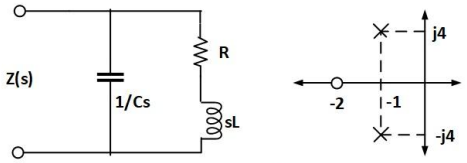

Fig. (8)

Q. 6) a. Obtain Z and Y parameters for the network shown in fig. (9). 10

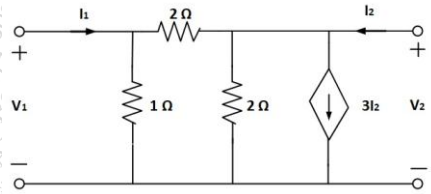

Fig. (9)

b. Determine the Foster form of realization of the RC impedance function 10

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

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