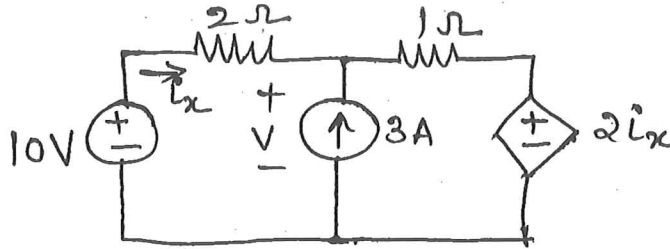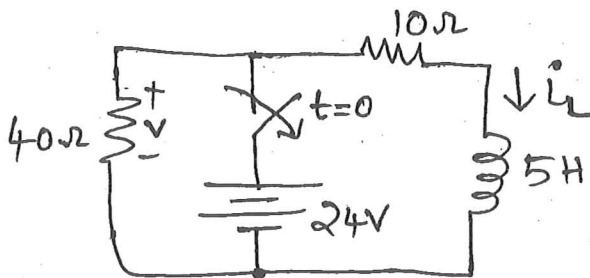(3 Hours)   [**Total Marks : 100**

N.B. (1) Question No. **1** is **compulsory**.
    (2) Answer any **four** questions from **remaining** questions.
    (3) **Figures** to the **right** indicate **full** marks.

1. (a) Use superposition principle to determine the value of i_x.   5
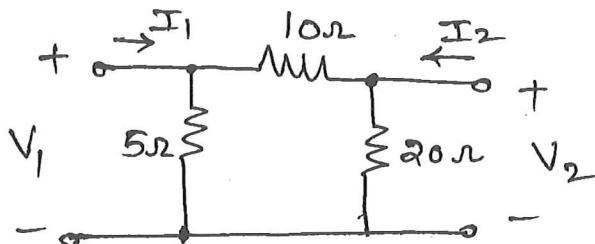

   (b) Find $i_L(0^+)$ and $V(0^+)$ in the circuit shown   5
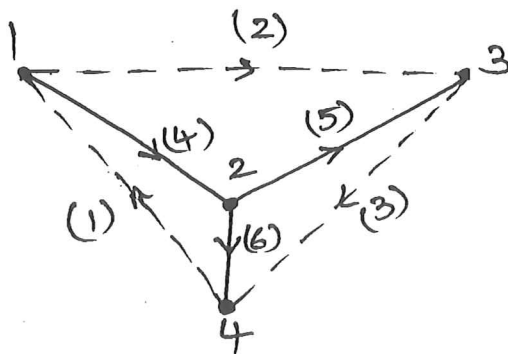

   (c) Explain duality with suitable examples.   5
   (d) Find admittance parameters for the two port network shown.   5

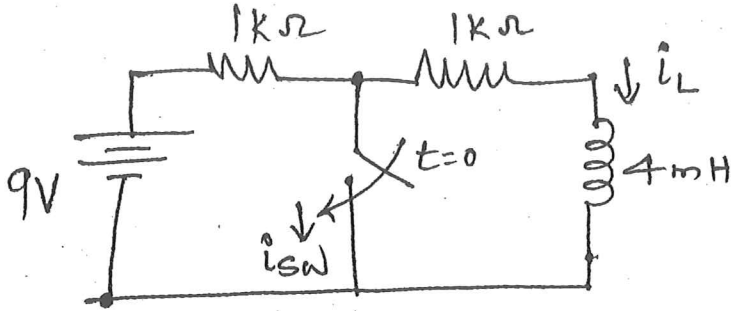2. (a) Find f-cutset and f-tieset matrices.   10

   (b) Find the laplace transform of shifted step, ramp and impulse functions.   6
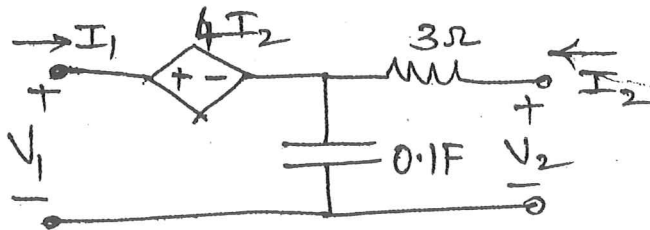   (c) Write any four restrictions on pole zero locations of driving point functions.   4

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3. (a) After being in the configuration shown for hours, the switch in the circuit is closed   **10**
        at t = 0. At t = 5 μ_s, calculate
            (i) i_L and.
            (ii)   Prove that i_{sw} = 7·71 mA at 5μs.

    (b) Compute z parameters for the circuit shown and show that $z_{11} = z_{21}$ **10**
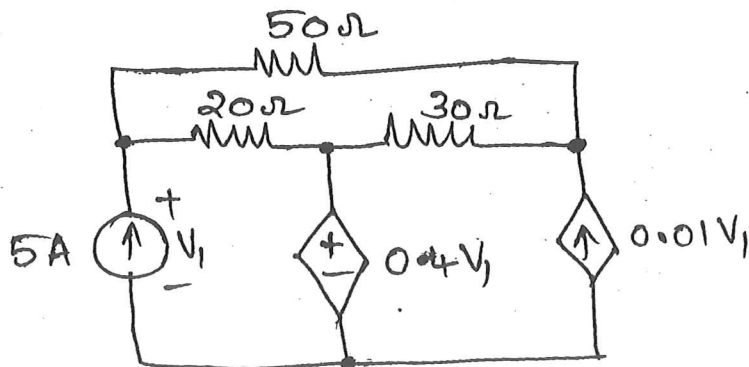

4. Find Foster I and II and Cauer I and II for the following impedance function–   **20**

$$z(s) = \frac{4\left(s^2 + 1\right)\left(s^2 + 9\right)}{s\left(s^2 + 4\right)}.$$

5. (a) Write the procedure for testing a positive real function .
    (b) Use nodal analysis to determine V_1 and the power being supplied by the dependent   **10**
        current source in the circuit shown.

6. (a) Find the Thevenin equivalent of the network shown. What power would be
   delivered to a load of 100 Ω at a and b ? **10**
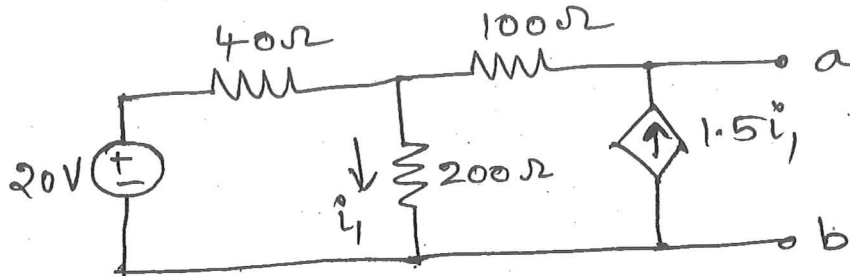
(b) Write short notes on initial conditions and its significance.

10

7. Write short notes on any **two** :–
   (a) Network equilibrium equation **20**
   (b) Waveform synthesis
   (c) Hybrid parameters
   (d) Properties of RC and RL functions.