Electrical Networks (CSEE 102 S1)
B.Tech-I Year
END Semester Examination, March 2021

Time: 3 Hours **SVNIT Surat** **Total Marks: 50**

1. In the frequency-domain circuit of Fig. 1, find (a) $\mathbf{I}_1$, $\mathbf{I}_2$ and $\mathbf{I}_3$, (b) the circuit impedance, (c) the power consumed, (d) the apparent power, (e) the reactive power, and (f) power factor. Sketch the phasor diagram. (10M)

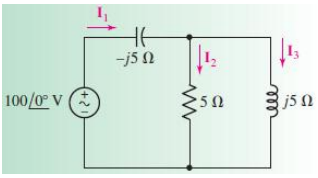

Figure. 1.

2. Find the energy stored in each capacitor and inductor, under steady-state conditions, in the circuit shown in Fig.2. (4 M)

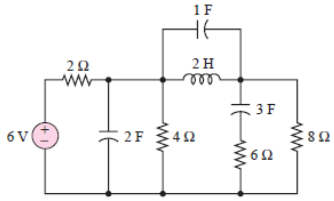

Figure.2.

3. Let $i_s = 10\cos 10t$ A in the circuit of Fig. 3, and find the total energy stored in the passive network at t = 0 if k = 0.8 and terminals *x* and *y* are (a) left open-circuited; (b) short-circuited. (4M).

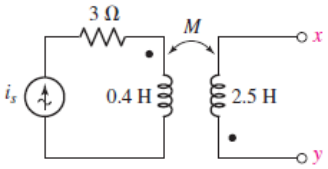

Figure.3

4. A three-phase balanced delta-connected load is connected to a three-phase, 400 V (line to line voltage), 50 Hz supply. It draws a line current of 34.64 A at 0.8 power factor lagging. Determine resistance and inductance of each branch. Further, determine the power drawn by each phase. (6M)

5. A 2.4-kVA, 2400/240-V, 50-Hz, step-down transformer has the following parameters.
Primary winding resistance and leakage reactance: $R_p = 1.5\ \Omega$, $X_p = 2.5\ \Omega$.
Secondary winding resistance and leakage reactance: $R_s = 0.02\ \Omega$, $X_s = 0.03\Omega$.
Magnetizing reactance and resistance equivalent to core loss: $X_m = 8\ k\Omega$, $R_C = 6\ k\Omega$.

   Transformer is operating at 80% of its load at unity power factor. Using the exact equivalent circuit model, determine the efficiency of the transformer. Also sketch its phasor diagram. Note: Transformer parameters are not referred to any side. All voltages are rms values. (8 M).

6. For the circuit of Figure 4 the switch has been open for a very long time. At t = 0 s the switch closes, and then at t = 30 ms the switch opens again. Determine the capacitor voltage as a function of time. $R_1 = R_2 = 700\ \Omega$, $R_3 = 400\ \Omega$, and $C = 20\ \mu F$. (10M)

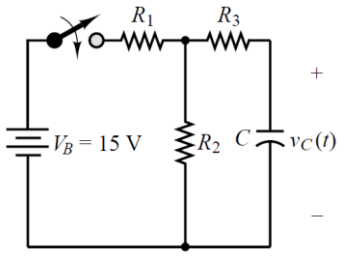

Figure.4.

7. Determine the current through 2.5 Ω resistor using Thevenin's in the network shown (4M).

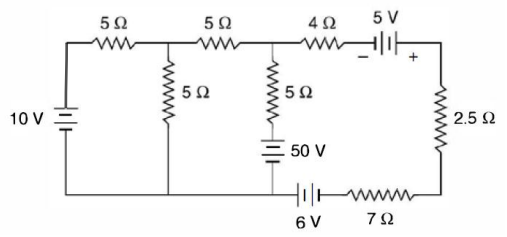

Figure 5

8. A series R-L-C circuit is designed to resonant at ω_r =105 rad/s, have a bandwidth of 0.15ω_r, and draw 20 W from a 100-V source at resonance (4M).
    a. Determine the value of R.
    b. Find the bandwidth in hertz.
    c. Find the values of L and C.
    d. Determine the Q_s of the circuit.