Department of ECE, Bennett University

CSET102L: Introduction to Electrical and Electronics Engineering

Tutorial Sheet-7

Topics Covered: Capacitance, Inductance, Impedance

1. Find the equivalent capacitance of the networks shown in fig. 1 through fig. 6.

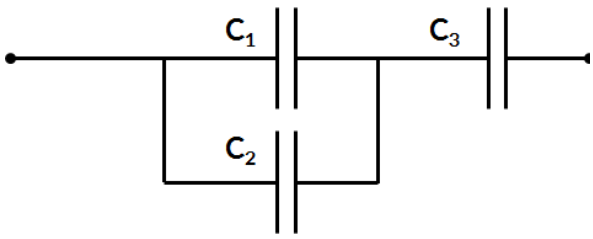

Fig. 1

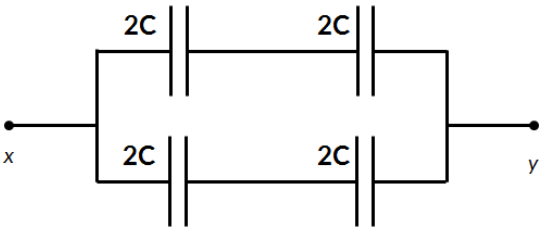

Fig. 2

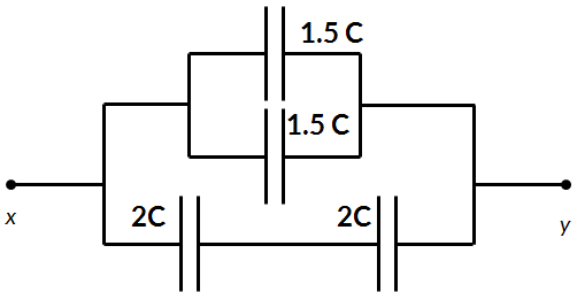

Fig. 3

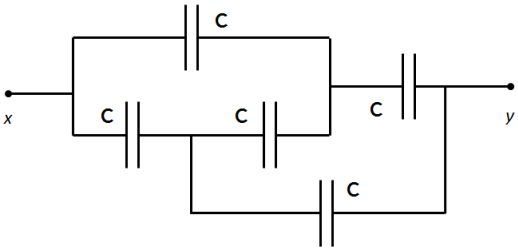

Fig. 4

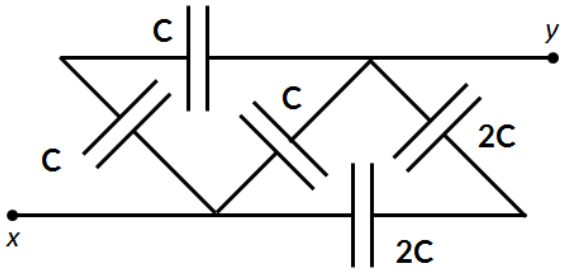

Fig. 5

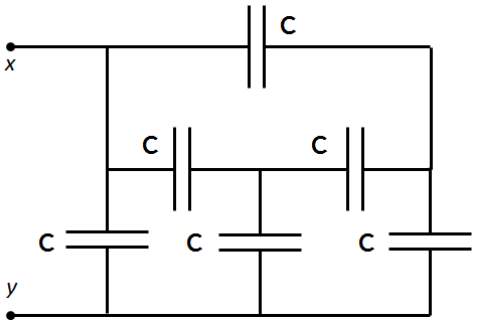

Fig. 6

2. Consider an RC circuit. The resistance (R) and capacitance (C) are varied in such a way that the time constant τ = RC is always constant. Explain the difference between the circuits when (i) R is small (ii) R is large and (iii) R is medium.

3. Find the equivalent impedance (impedance between points *A* and *B* for the circuit shown in Fig. 7. Given that $\omega = 2.5 \times 10^3$ rad/sec.

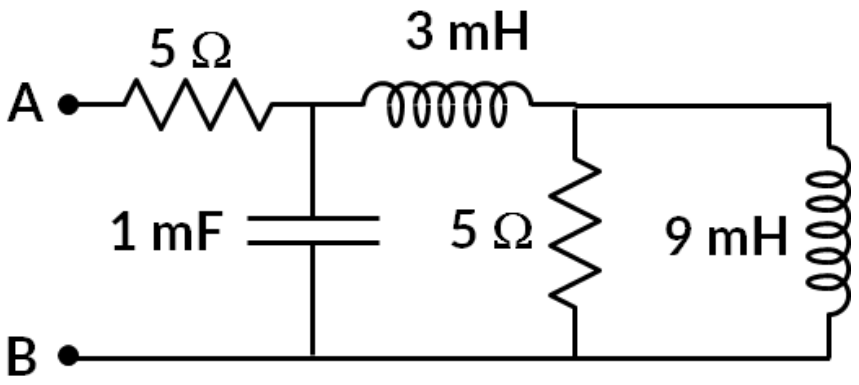

Fig. 7

4. For the circuit shown in Fig. 8, for ω = 4000 rad/sec, the impedance across *A* and *B* is $(25 + j10)\ \Omega$. What is the value of inductor?

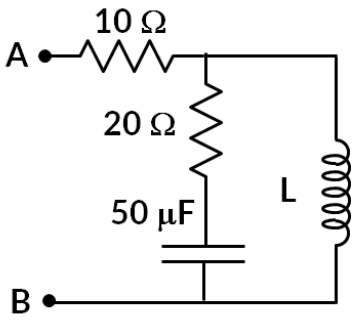

Fig. 8

5. In the circuit shown in Fig. 9, If $v(t)$ and $i(t)$ are in phase, what is the value of *L*?

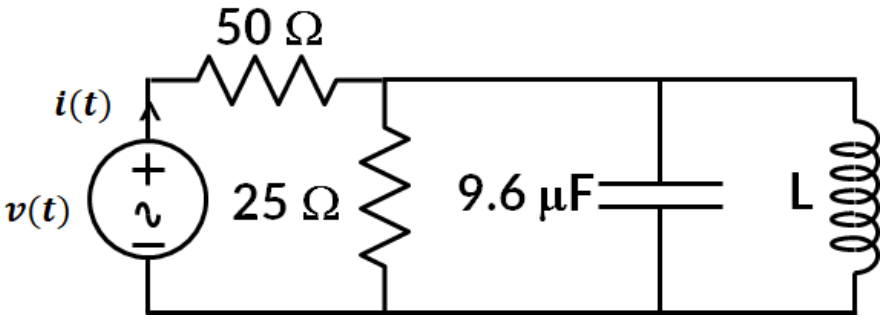

Fig. 9

6. In the circuit shown in Fig. 10, find the charge and energy stored by the 20 μF capacitor.

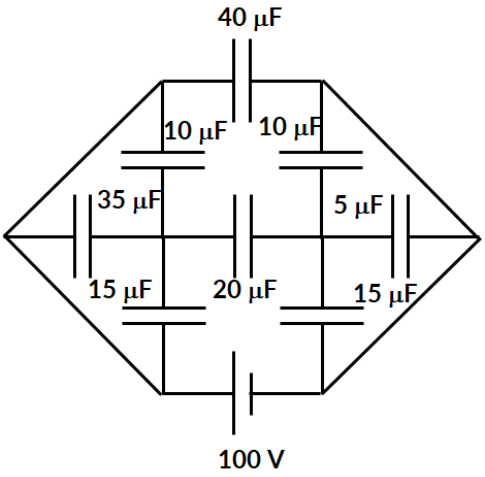

Fig. 10

7. In the circuit shown in Fig. 11, in a steady state, find the voltage drop across 2 F capacitor.

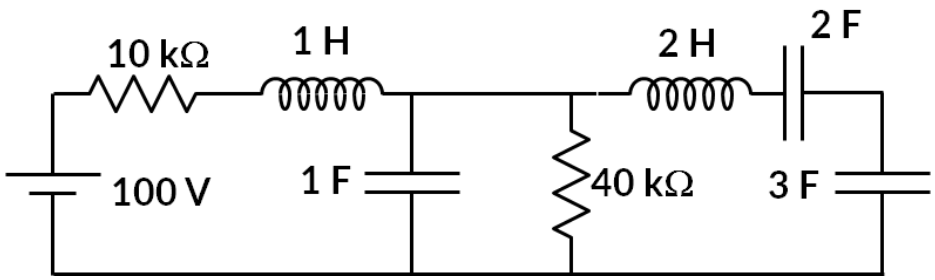

Fig. 11

Topics Covered: Filter Circuits

8. For the circuit shown in Fig. 12, identify the filter type, find the transfer function and cut-off frequency of the filter. The output of the filter is taken between nodes *C* and *D*.

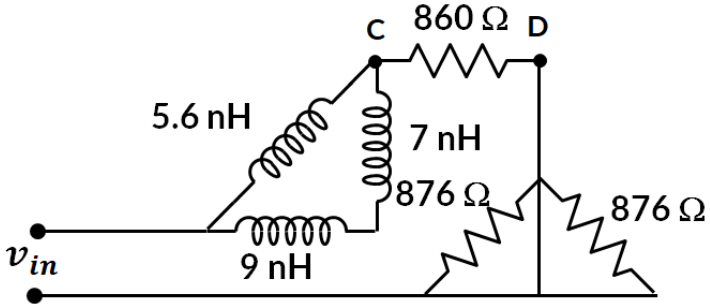

Fig. 12

9. For the circuit shown in Fig. 13, identify the filter type, find the transfer function and cut-off frequency of the filter. The output of the filter is taken between nodes *C* and *D*.

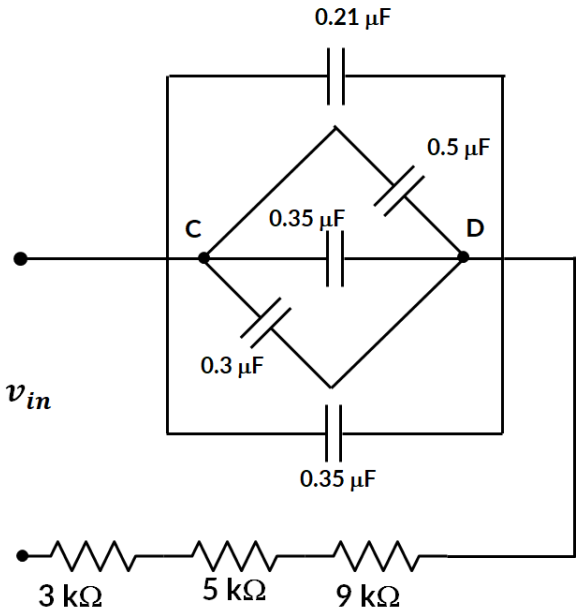

Fig. 13

10. For the circuit shown in Fig. 14, identify the filter type, find the transfer function and cut-off frequency of the filter. The output of the filter is taken between nodes *C* and *D*.

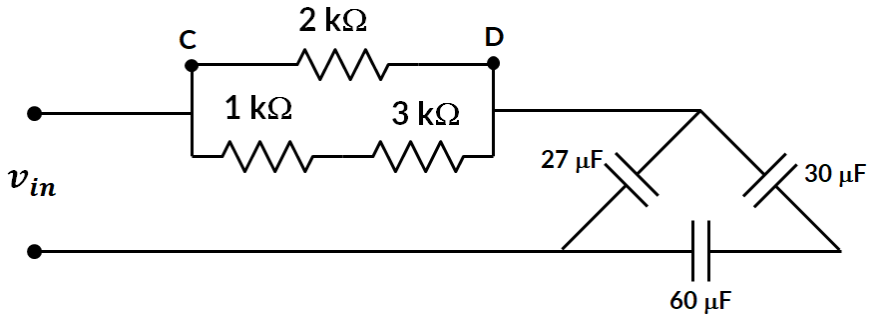

Fig. 14

11. For the circuit shown in Fig. 15, identify the filter type, find the transfer function and cut-off frequency of the filter. Input and output to the filter are between *A* and *B*; *B* and *C* respectively.

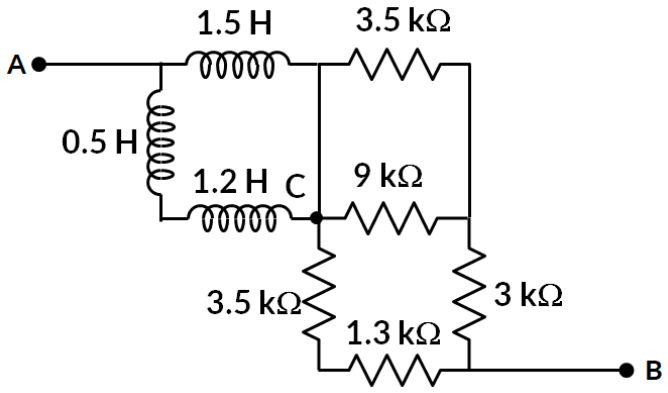

Fig. 15

---------- END OF QUESTIONS ----------

Answers:

1)

Fig. 1	$C_{eq} = \frac{(C_1 + C_2)C_3}{C_1 + C_2 + C_3}$
Fig. 2	2C
Fig. 3	4C
Fig. 4	C
Fig. 5	2.5 C
Fig. 6	2C

3) $(4.586 + j0.014)\Omega$

4) 6.25 mH

5) 6.5 mH

6) 1000 µC, 0.025 W

7) 48 V

8) $f_c = 207.3\ GHz |H(\omega)| = \frac{1}{\sqrt{1+2.38\times10^{-23}\omega^2}}$

9) $f_c = 5.47\ Hz, |H(\omega)| = \frac{1}{\sqrt{1+0.029\omega^2}}$

10) $f_c = 2.54\ Hz, |H(\omega)| = \frac{0.063\omega}{\sqrt{1+3.9\times10^{-3}\omega^2}}$

11) $f_c = 510\ Hz, |H(\omega)| = \frac{\omega 2.32\times10^3}{\sqrt{1+\omega^2 5.38\times10^3}}$