Department of ECE, Bennett University

EECE105L: Fundamentals of Electrical and Electronics Engineering

Tutorial Sheet-10

Topics Covered: Capacitance, Inductance, Impedance

Note: Questions 1, 3, 7 and 8 will be discussed in tutorial sessions. Remaining problems are the student's efforts.

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

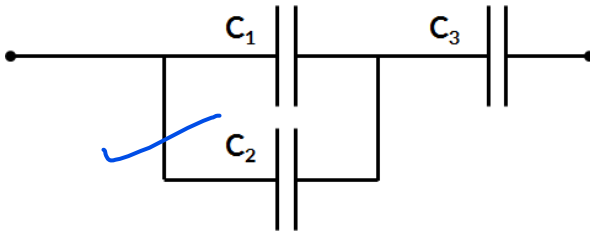

Fig. 1

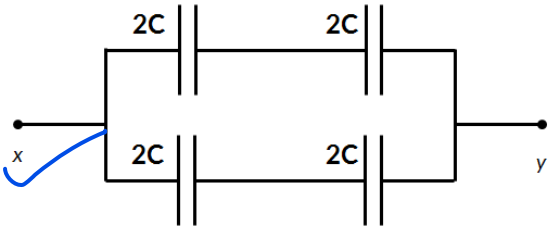

Fig. 2

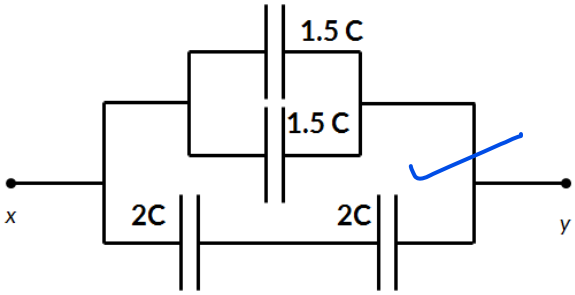

Fig. 3

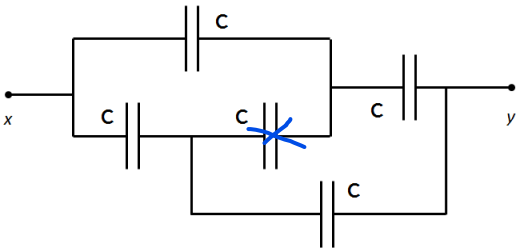

Fig. 4

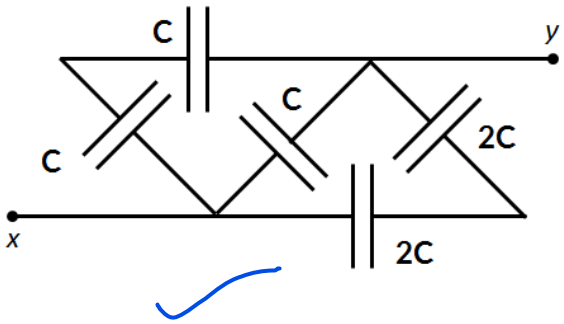

Fig. 5

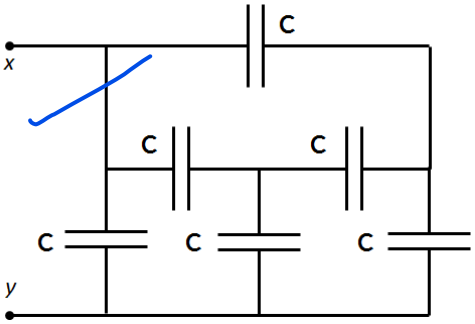

Fig. 6

2. Consider an RC circuit. The resistance (R) and capacitance (C) are varied in such a way that the time constant $\tau = RC$ 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.

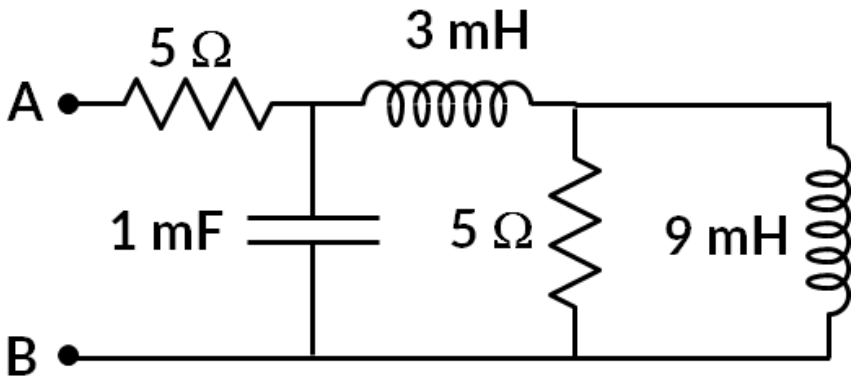

Fig. 7

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?

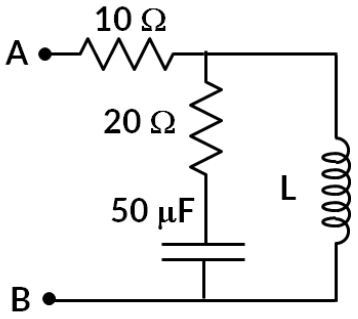

Fig. 8

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

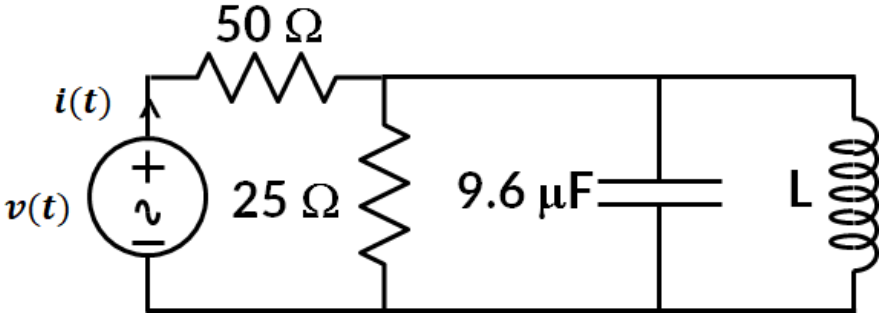

Fig. 9

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

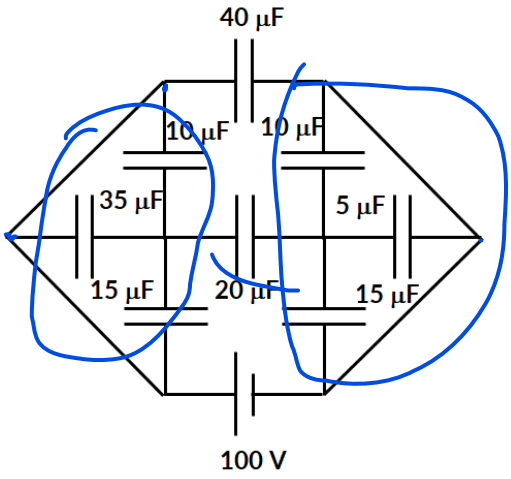

Fig. 10

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

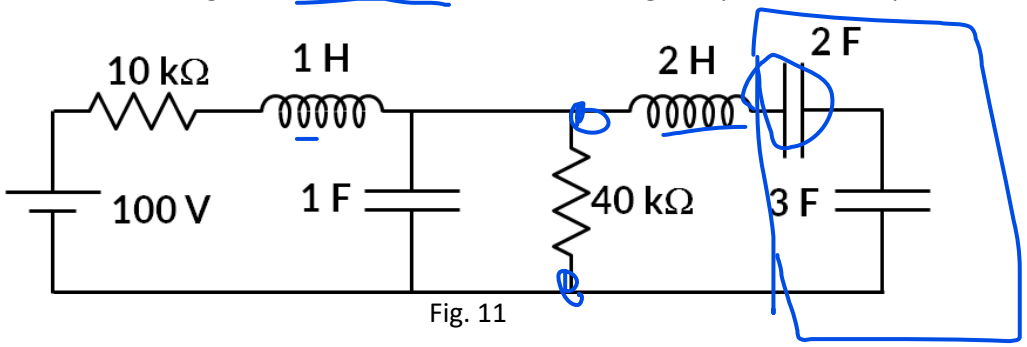

Fig. 11

8. If a current $i(t) = \sin(377t)$ is applied to a 2 mH inductor, find the voltage across the inductor and energy stored by the inductor.
9. The voltage applied across a 50 μF capacitor is given by the waveform shown in Fig. 12. What is the current through the capacitor at 2 ms and 3 ms?

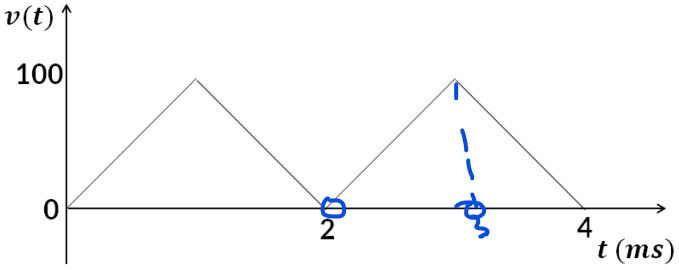

Fig. 12

10. If the current flowing through a 2 mH inductor is given by $i(t) = 5.3\ t^2 + 4.7\ t$, find the power stored by the inductor.

---------- 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) $0.754\ \cos(377\ t)$, $0.01 \sin^2(377\ t)$

9) 5 mA, -5 mA

10) $16.8t^3 + 22.4\ t^2 + 6.6\ t$