Department of ECE, Bennett University

EECE105L: Fundamentals of Electrical and Electronics Engineering

Tutorial Sheet-11

Topics Covered: Filter Circuits

1. For the circuit shown in Fig. 1, 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*.

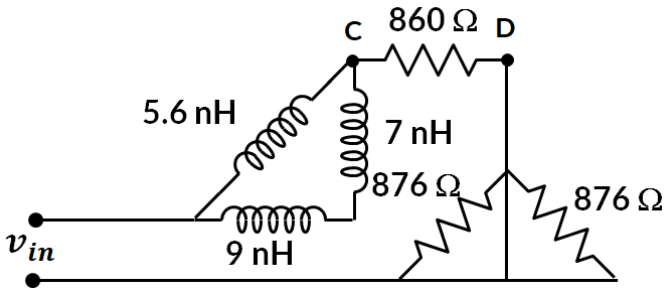

Fig. 1

2. For the circuit shown in Fig. 2, 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*.

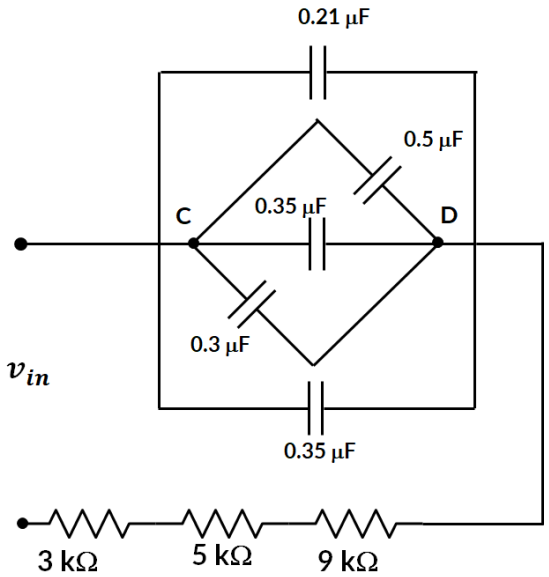

Fig. 2

3. For the circuit shown in Fig. 3, 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*.

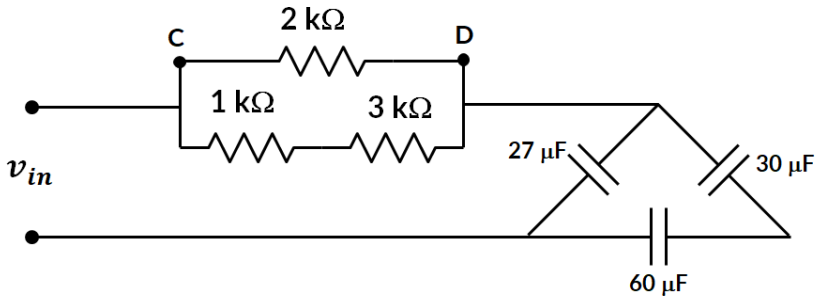

Fig. 3

4. For the circuit shown in Fig. 4, 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.

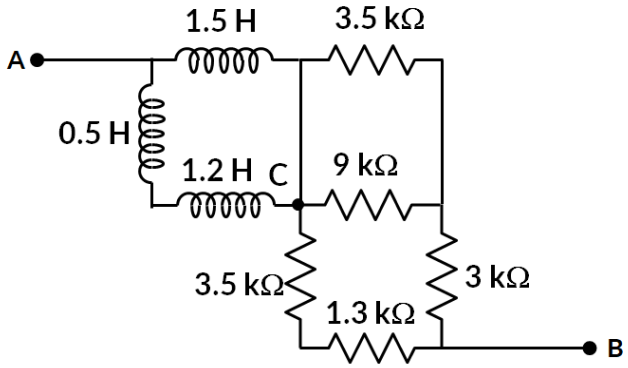

Fig. 4

5. Consider an RC Low pass filter and RL low pass filter. What are the subtle differences?

6. Consider an RC filter. 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 different filter circuits when (i) R is small (ii) R is large and (iii) R is medium.

7. Using a combination of high-pass and low-pass filters, explain how the following filters can be designed? (a) A band-pass filter (b) Band-reject filter

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

Solutions:

1) $f_c = 1302.5\ GHz |H(\omega)| = \frac{1}{\sqrt{1+2.38\times10^{-23}\omega^2}}$
2) $f_c = 5.47\ Hz, |H(\omega)| = \frac{1}{\sqrt{1+0.029\omega^2}}$
3) $f_c = 2.54\ Hz, |H(\omega)| = \frac{0.063\omega}{\sqrt{1+3.9\times10^{-3}\omega^2}}$
4) $f_c = 510\ Hz, |H(\omega)| = \frac{\omega 2.32\times10^3}{\sqrt{1+\omega^2 5.38\times10^3}}$