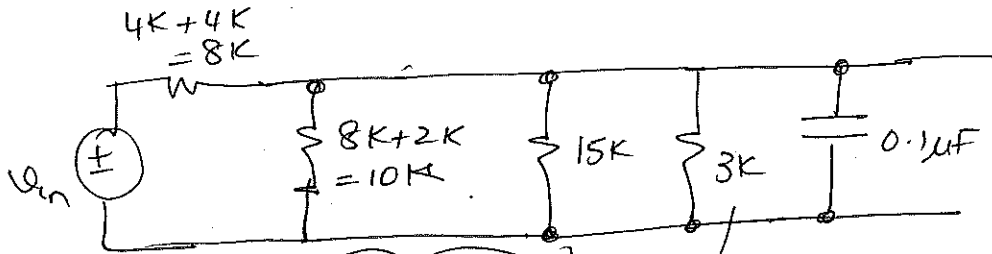
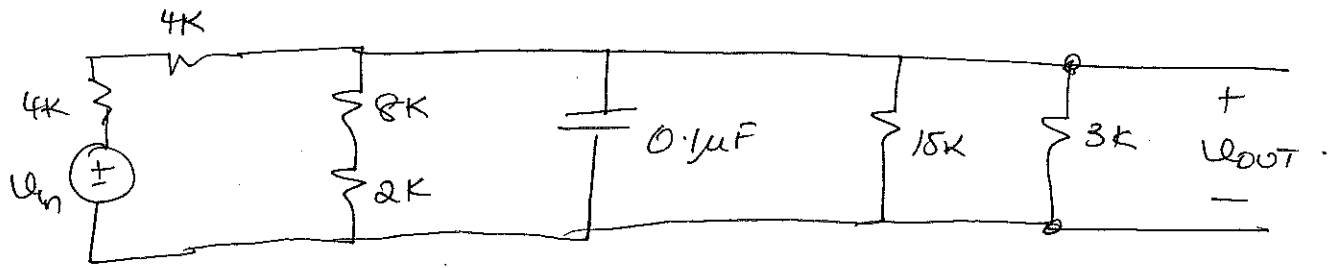


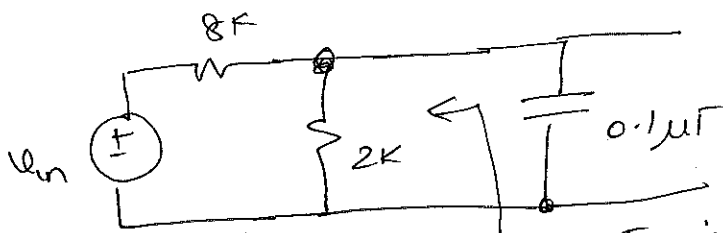
1.

HW# 2 Solutions.

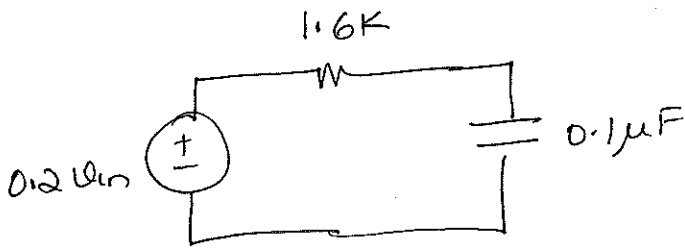
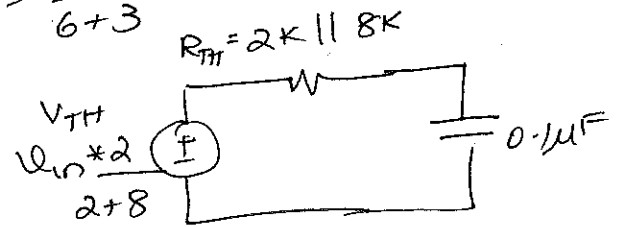


$$15K \parallel 10K = \frac{10 \times 15}{10 + 15} = 6K$$

$$6K \parallel 3K = \frac{6 \times 3}{6 + 3} = 2K$$

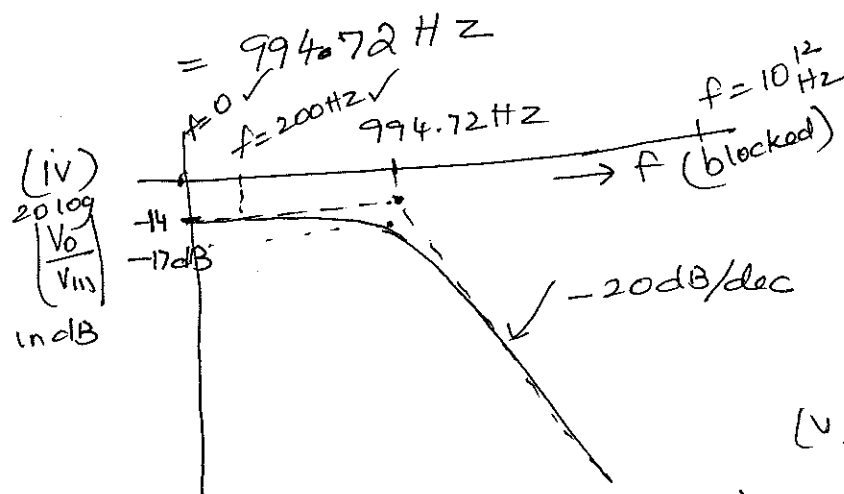


Thevenin Equivalent



$$(iii) f_0 = \frac{1}{2\pi RC} = \frac{1}{2\pi \times 1.6K \times 0.1\mu F}$$

$$= 994.72 \text{ Hz}$$



(a) $\omega = 0$

$$\frac{V_{out}}{V_{in}} = 0.2$$

$$20 \log 0.2 = -13.97 \text{ dB}$$

(b) $\omega = \infty$

$$V_{out} = 0$$

(c) L P F (low pass filter)

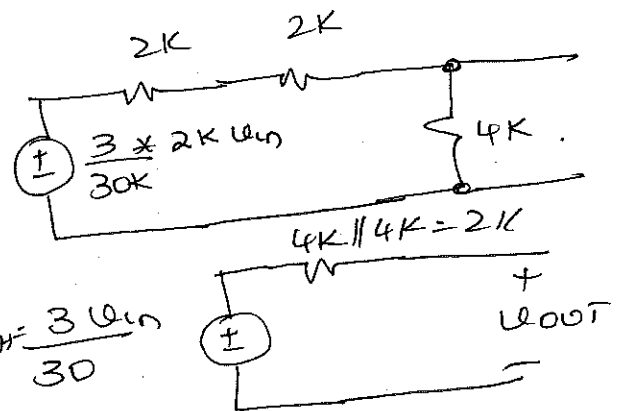
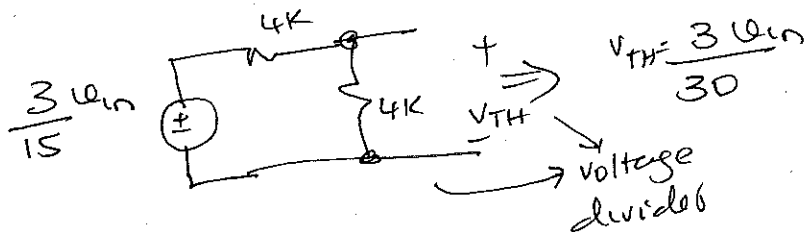
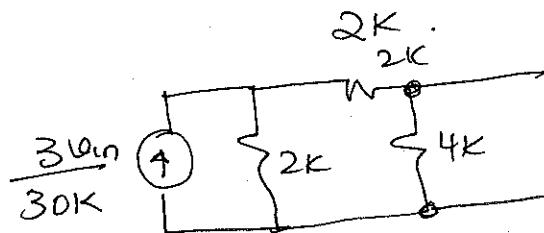
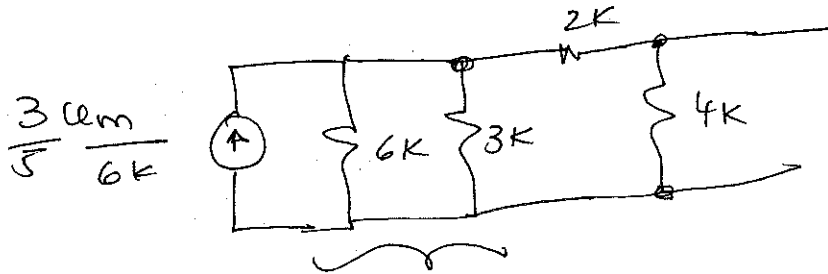
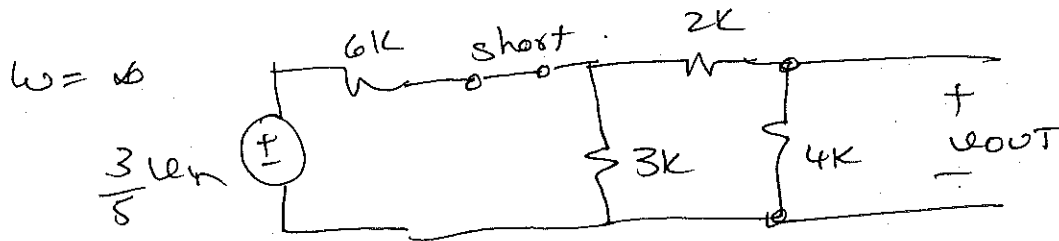
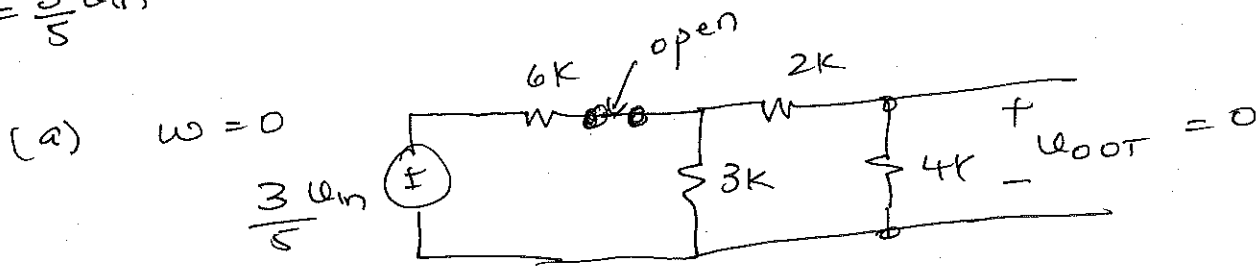
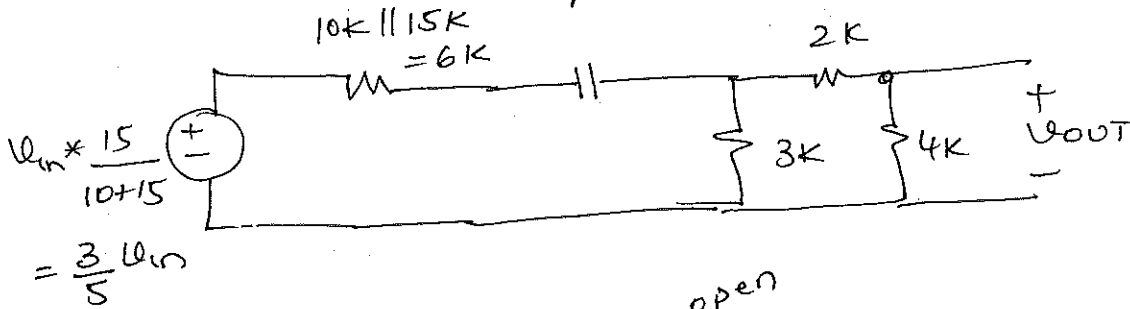
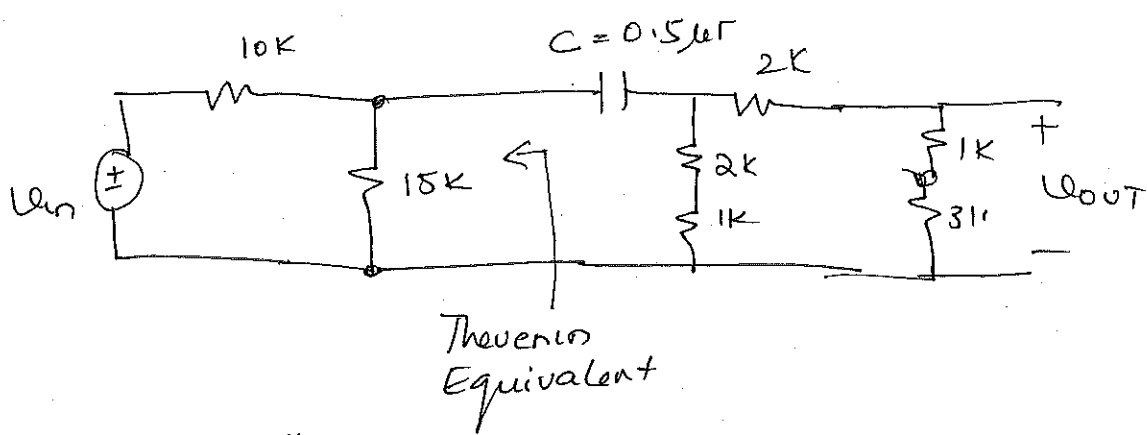
$f=0$ passes $f=200 \text{ Hz}$ passes $f=10^{12} \text{ Hz}$ gets blocked

$$V_{in}(t) = 2 + 6 \sin 2\pi(200)t + \sin 2\pi 10^{12}t$$

$$V_{out}(t) = 0.2 \times 2 + 0.2 \times 6 \sin 2\pi(200)t$$

$$= 0.4 + 1.2 \sin 400\pi t$$

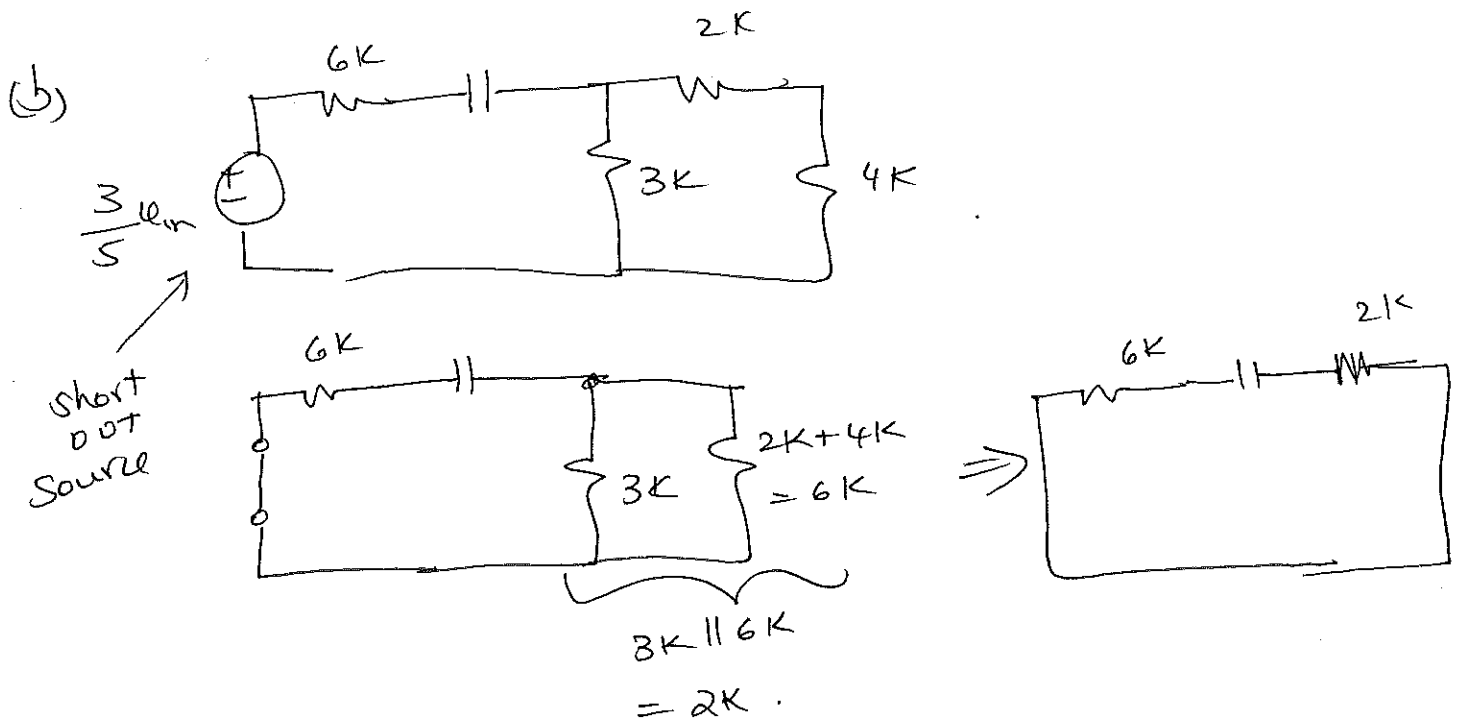
2.



$$20 \log \frac{1}{10} = -20 \text{ dB}$$

$$V_{out} = \frac{V_{in}}{10}$$

$$\frac{V_{out}}{V_{in}} = \frac{1}{10}$$



$$R_{eq} = 6K + 2K = 8K$$

$$f_0 = \frac{1}{2\pi \cdot 8K \cdot 0.5\mu F} = 39.79 \text{ Hz}$$

(c)

$$v_{in}(t) = 3 + \sin(2\pi \cdot 60t) + 9 \sin(2\pi \cdot 10^{10}t)$$

$f=0$ blocked
 $f=60\text{Hz}$ passes ✓
 $f=10^{10}\text{Hz}$ passes ✓

$v_{out}(t) = 0.1 \sin(2\pi \cdot 60t) + 0.9 \sin(2\pi \cdot 10^{10}t)$

