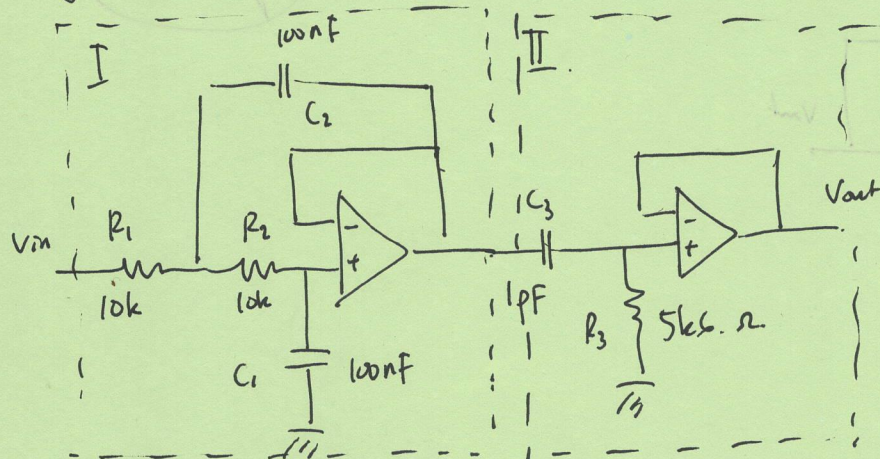


Kunci Jawaban RE2. (UAS.)

30 poin.

1.



a) orde filter.

Pengaliran I : low pass orde 2. (+5)

Pengaliran II : high pass orde 1 (+5)

b.) Band stop filter. (+5)

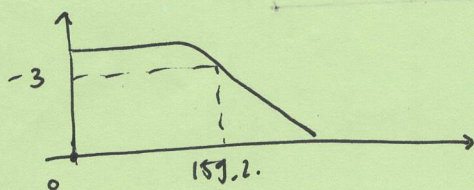
c.) Pengaliran I. (+5)

$$f_c = \frac{1}{2\pi \sqrt{R_1 R_2 C_1 C_2}}$$

$$= \frac{1}{2\pi \sqrt{10k \cdot 10^4 \cdot 10^{-4} \cdot 10^{-7} \cdot 10^{-7}}}$$

$$= \frac{1}{2\pi \cdot 10^4 \cdot 10^{-7}}$$

$$= \frac{1}{2\pi \cdot 10^{-3}} = \frac{1000}{2\pi} = 159.2 \text{ Hz.}$$



Pengaliran II. (+5)

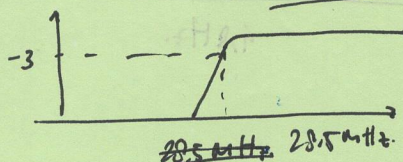
$$f_c = \frac{1}{2\pi R_3 C_3}$$

$$= \frac{1}{2\pi \cdot 10^{-2} \cdot 5.6 \cdot 10^{-3}}$$

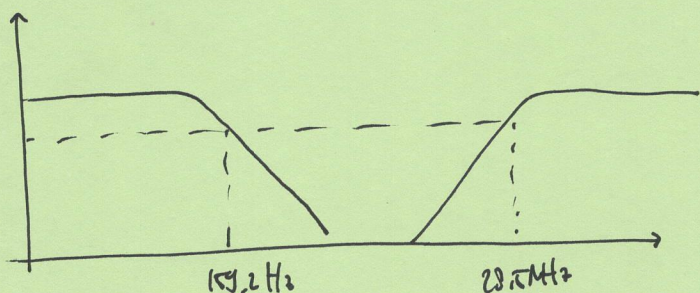
$$= \frac{1}{2\pi \cdot 5.6 \cdot 10^{-5}}$$

$$= \frac{10^5}{2\pi \cdot 5.6} = \frac{10^9}{17.5824} = 55.168$$

$$= 28.5 \text{ MHz.}$$

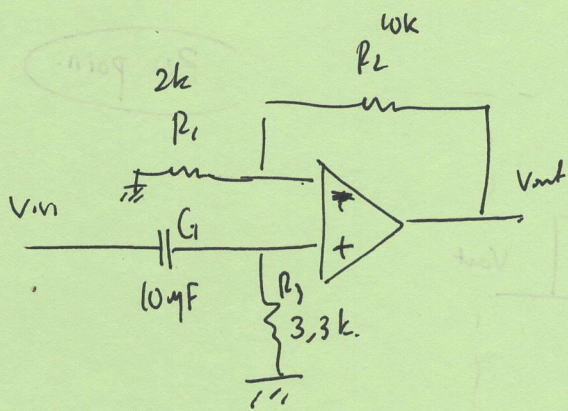


d.)



(+5)

2.



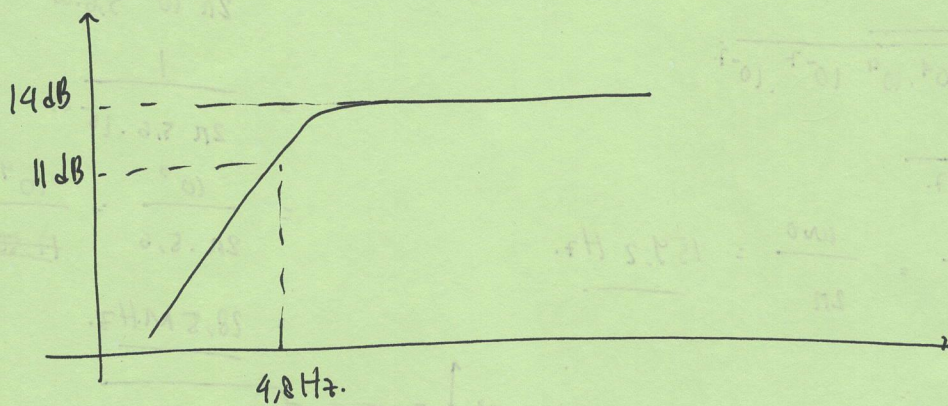
a) order 1. (+5)

b) high pass filter. (+5)

$$c.) f_c = \frac{1}{2\pi R_3 C_1} = \frac{1}{2\pi \cdot 3.3 \cdot 10^3 \cdot 10^{-5}} = \frac{10^2}{2\pi \cdot 3.3} = \frac{10^2}{20.724} = 4.8 \text{ Hz.} \quad (+10)$$

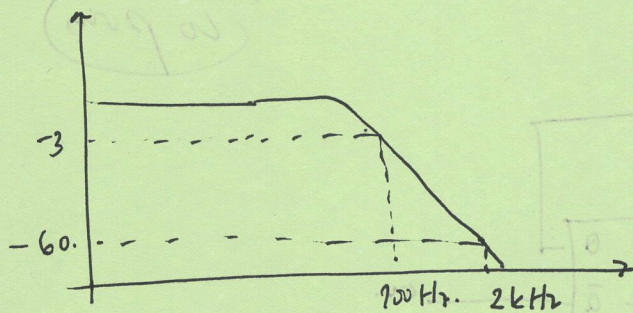
$$d.) A = \frac{R_2}{R_1} + 1 = \frac{10k}{2k} + 1 = 6 \times. \quad (+10)$$

$$\text{dB} = 20 \cdot \log 6 = 20 \cdot (\log 2 + \log 3) = 20 (0.77) = 14 \text{ dB}$$



3.)

a)



low pass filter.

20 points

b) order filter.

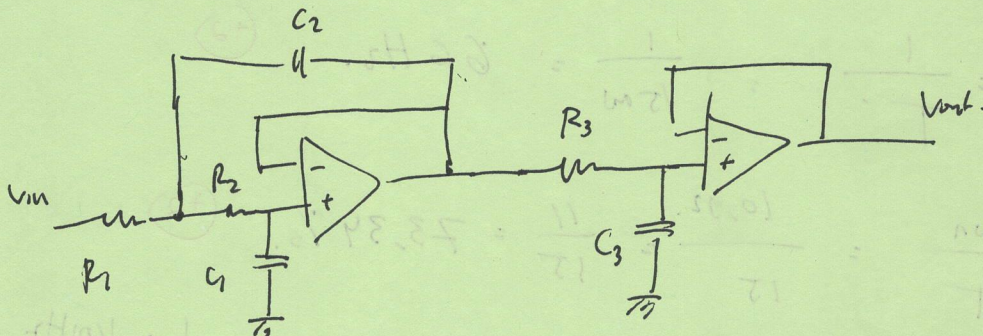
$$A = \frac{V_o}{V_i} = \frac{2mV_{pp}}{2V_{pp}} = 10^{-3} \times$$

$$A_{dB} = 20 \cdot \log \frac{V_o}{V_i} = 20 \cdot \log 10^{-3} = -60 \text{ dB.}$$

$$n = \frac{-60 - (-3)}{\log 20 - \log 10} = \frac{-57}{1} = -57$$

$$n_{\text{filter}} = \frac{-57}{-20} \approx 3 \quad \text{order 3.}$$

c)



d)

$$f_c = \frac{1}{2\pi(R_1 R_2 C_1 C_2)^{1/2}}$$

anyway $k = \omega k$.

$$2\pi f_c = \frac{1}{2\pi R C}$$

$$2\pi f_c = \frac{1}{2\pi 10^4 C}$$

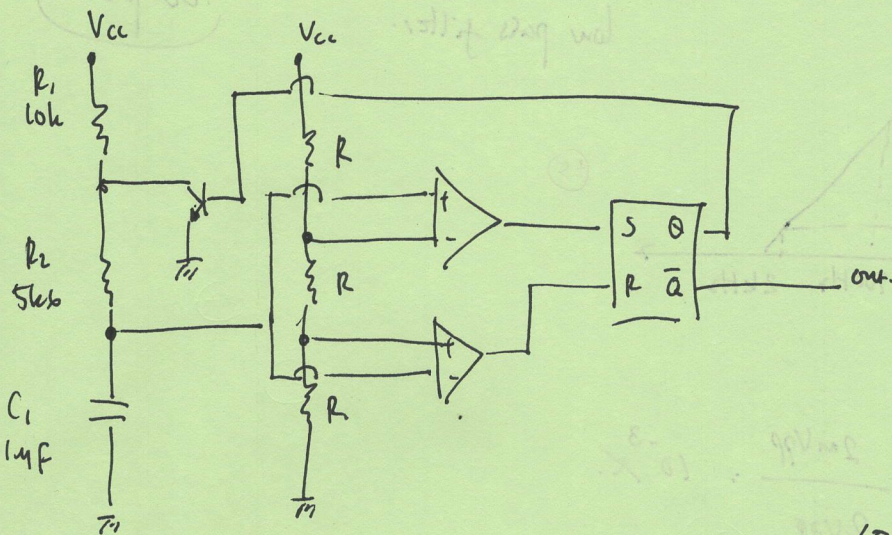
$$C = \frac{1}{2\pi 10^4 2 \cdot 10^2}$$

$$C = \frac{1}{4\pi \cdot 10^6}$$

$$C = 0,08 \cdot 10^{-6} \text{ uF}$$

$$= 80 \text{ nF.}$$

4.)



$$a.) t_{on} = 0,7 (C_1 (R_1 + R_2)) = 0,7 \cdot 10^{-6} (10 + 5,6 \cdot 10^3) = 39,2 \cdot 10^{-3} s. \quad (+3)$$

$$b.) t_{off} = 0,7 (C_1 R_2) = 0,7 \cdot 10^{-6} \cdot 5,6 \cdot 10^3 = 3,92 \cdot 10^{-3} s. \quad (+3)$$

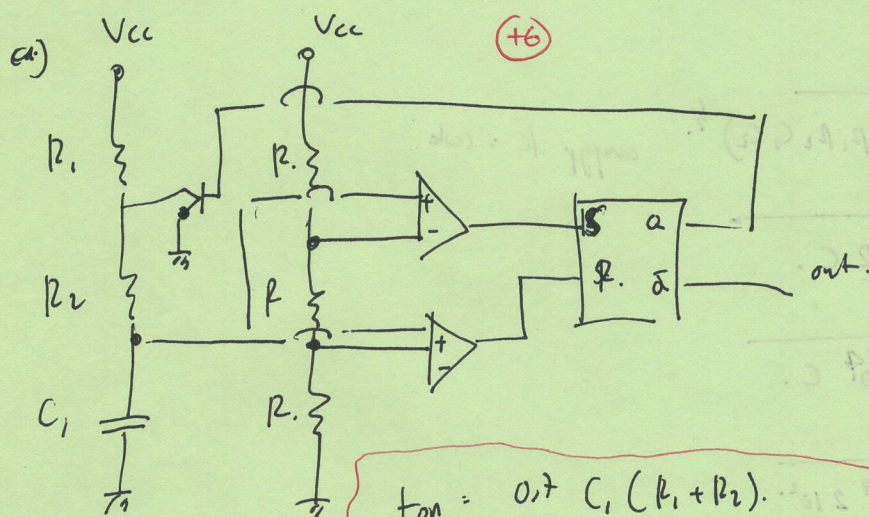
$$c.) f_{req.} = \frac{1}{T} = \frac{1}{t_{on} + t_{off}} = \frac{1}{10,92 \cdot 10^{-3} + 3,92 \cdot 10^{-3}} = 15 ms.$$

$$f = \frac{1}{T} = \frac{1}{15 ms} = 66 Hz. \quad (+2)$$

$$d.) DC = \frac{t_{on}}{T} = \frac{10,92}{15} = \frac{11}{15} = 73,34 \%. \quad (+2)$$

5.)-

(10pwm)



$$b.) f = 100 Hz$$

$$T = 10 ms.$$

$$DC = 75 \%$$

$$t_{on} = 7,5 ms.$$

$$t_{off} = 2,5 ms.$$

$$C_1 = 14F.$$

$$7,5 ms = 0,7 (C_1 R_1).$$

$$7,5 ms = 0,7 (14F R_2).$$

$$7,5 \cdot 10^{-3} = 0,7 (10^{-6} R_2).$$

$$t_{on} = 0,7 C_1 (R_1 + R_2).$$

$$7,5 = 0,7 \cdot 10^{-6} (3,57 \cdot 10^3 + R_1).$$

$$\frac{7,5 \cdot 10^3}{0,7} - 3,57 \cdot 10^3 = R_1.$$

$$R_1 = (10,71 - 3,57) 10^3 = 7,14 k.$$

$$\frac{7,5 \cdot 10^3}{0,7} = R_2.$$

$$3,57 k = R_2. \quad (+4)$$