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Analog Tute 7

Q1

Total gain $= 40 \times 50 \times 60$

$= 12 \times 10^4$

Total gain in dB $= 20(\log_{10}(40) + \log_{10}(50) + \log_{10}(60))$

$= 20(1.602 + 1.699 + 1.778)$

$= 101.58$ dB

Q2

$$f_1' = \frac{1}{\sqrt{2^{1/n} - 1}} f_1$$

$$f_2' = \sqrt{(2^{1/n} - 1)}\ f_2$$

$$\frac{A_{V_c}}{A_{V_M}} = \frac{1}{\sqrt{1 + \frac{f_1^2}{f^2}}}$$

Q3

$$f_1' = \frac{64}{\sqrt{2^{1/2} - 1}} = 99.44\ Hz$$

$$f_2' = \sqrt{(2^{1/2} - 1)}\ (10) = 6.43\ kHz$$

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Q5 $Z_i = R_1 \parallel R_2 \parallel h_{ie}$

$$R_1 \parallel R_2 = \frac{47(10)}{57} = 8.246\ K\Omega$$

$$8.246\ K\Omega \parallel h_{ie} = \frac{(8.246)(2.2)}{10.446}$$

$$Z_i = 1.737\ K\Omega$$

$$Z_o = \frac{1}{h_{oe}} = 4\ K\Omega$$

$$Z_{os} = Z_o \parallel R_C = \frac{4(4.7)}{8.7} = 2.16\ K\Omega$$

Volt gain of Ist stage

$$A_1 = -\frac{h_{fe}}{h_{ie}} \times R_{ac}$$

$$= \frac{-4.7(R_5 \parallel R_3 \parallel R_6 \parallel h_{ie})}{2.2}$$

$R_{ac_1} = R_3 \parallel 1.737\ K\Omega$

$$= \frac{(4.7)(1.737)}{6.437} = 1.27\ K\Omega$$

$$A_1 = \frac{-4.7 \times 1.27}{2.2} = -2.71\ K\Omega$$

Volt gain of IInd stage, $A_2 = \frac{-4.7}{2.2} \times 2.16 = -4.61\ K\Omega$

overall gain (A) = $12.5\ K\Omega$

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Q6 $25 = 10 \log_{10}\left(\frac{P_o}{10}\right)$

$10^{2.5} = \frac{P_o}{10^{-2}}$

$P_o = 10^{0.5} = 3.16\ W$

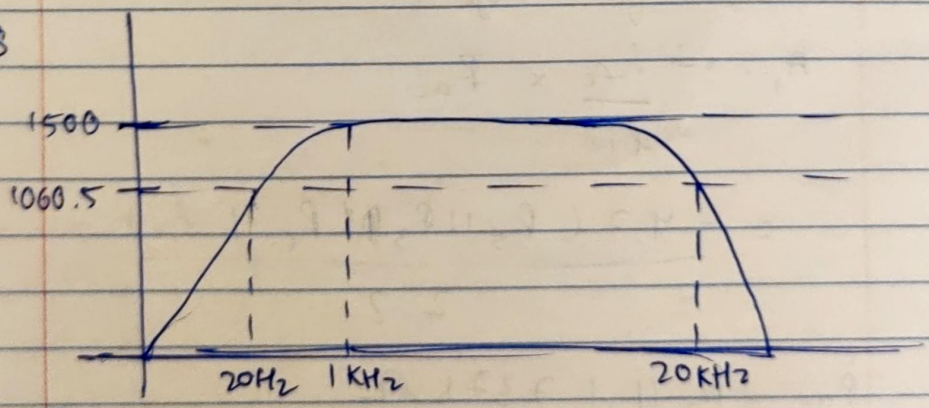
Q7 $A_{V_1} = \frac{-50}{1.1}\ (4 \parallel 10 \parallel 2 \parallel 1.1)$

$= -25.85$

$A_{V_2} = \frac{-50}{1.1}\ (2 \parallel 10) = -75.91$

Overall gain = 1962.27

Q8



1060.5 = 70.7% of 1500

∴ Lower cutoff freq. = 20Hz

Higher cutoff freq. = 20KHz

$f_2 - f_1 = 20k - 20 = 19.8k$