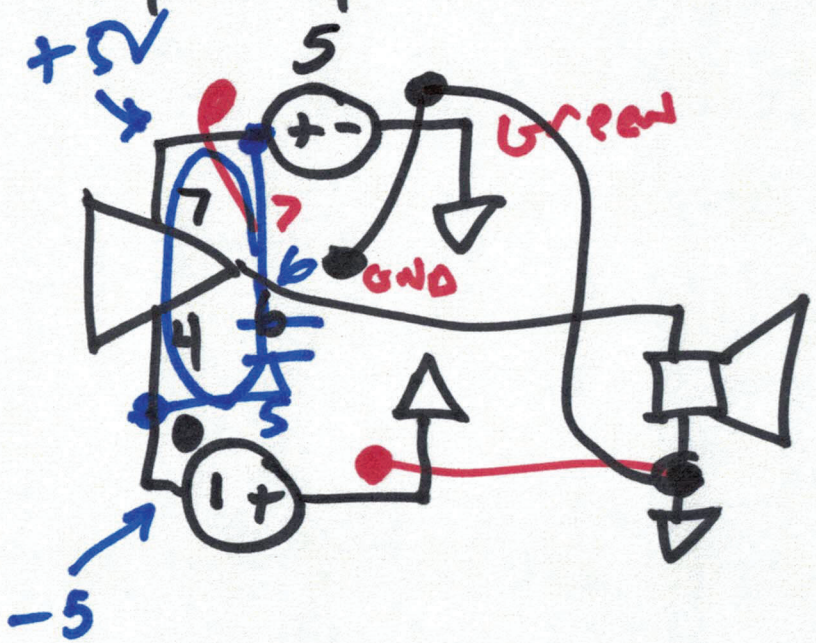
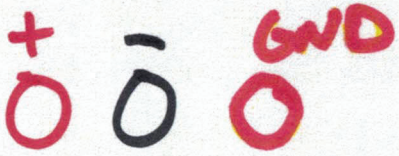
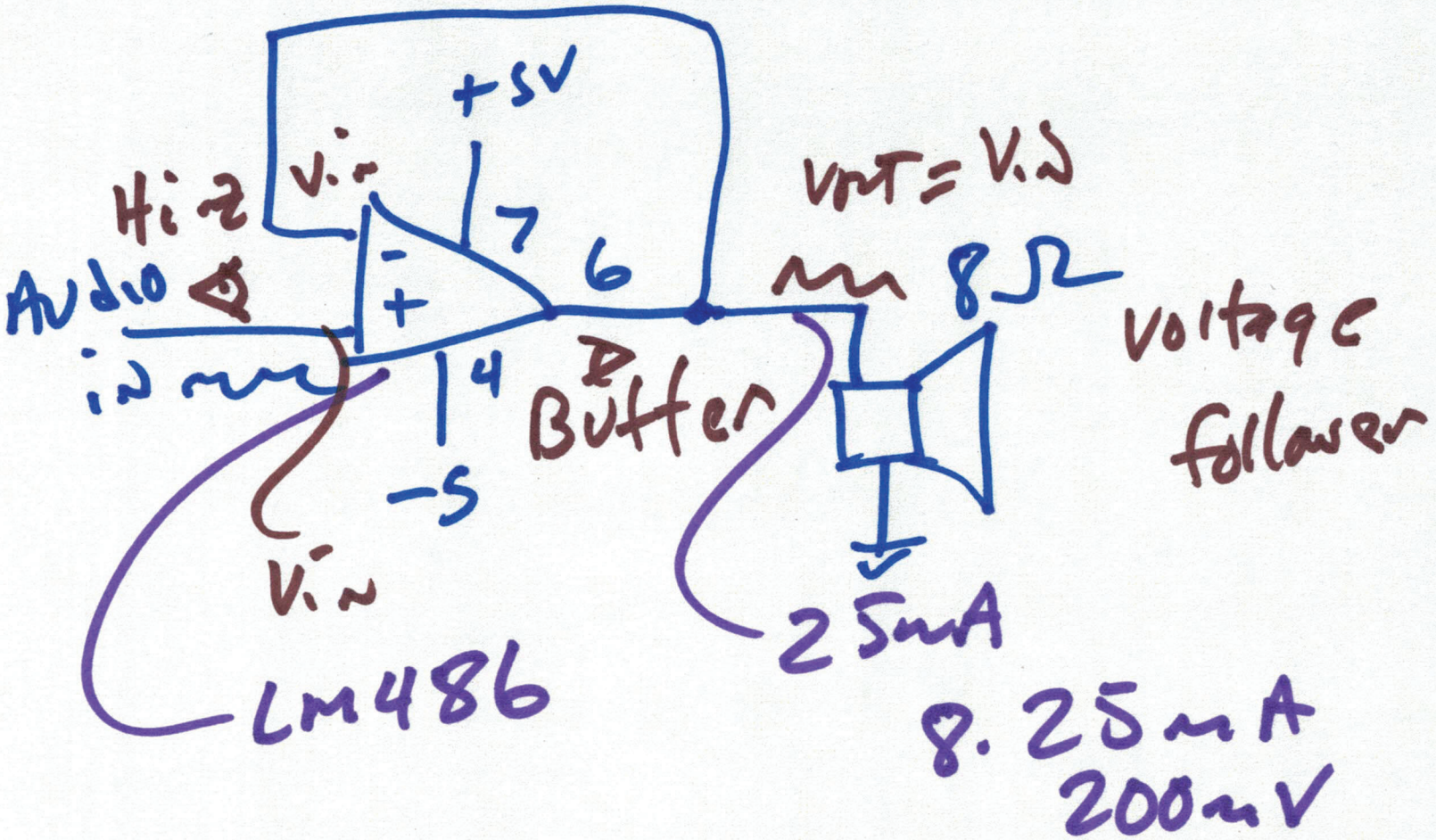
EE 221 CIRCUITS II

Lecture 26

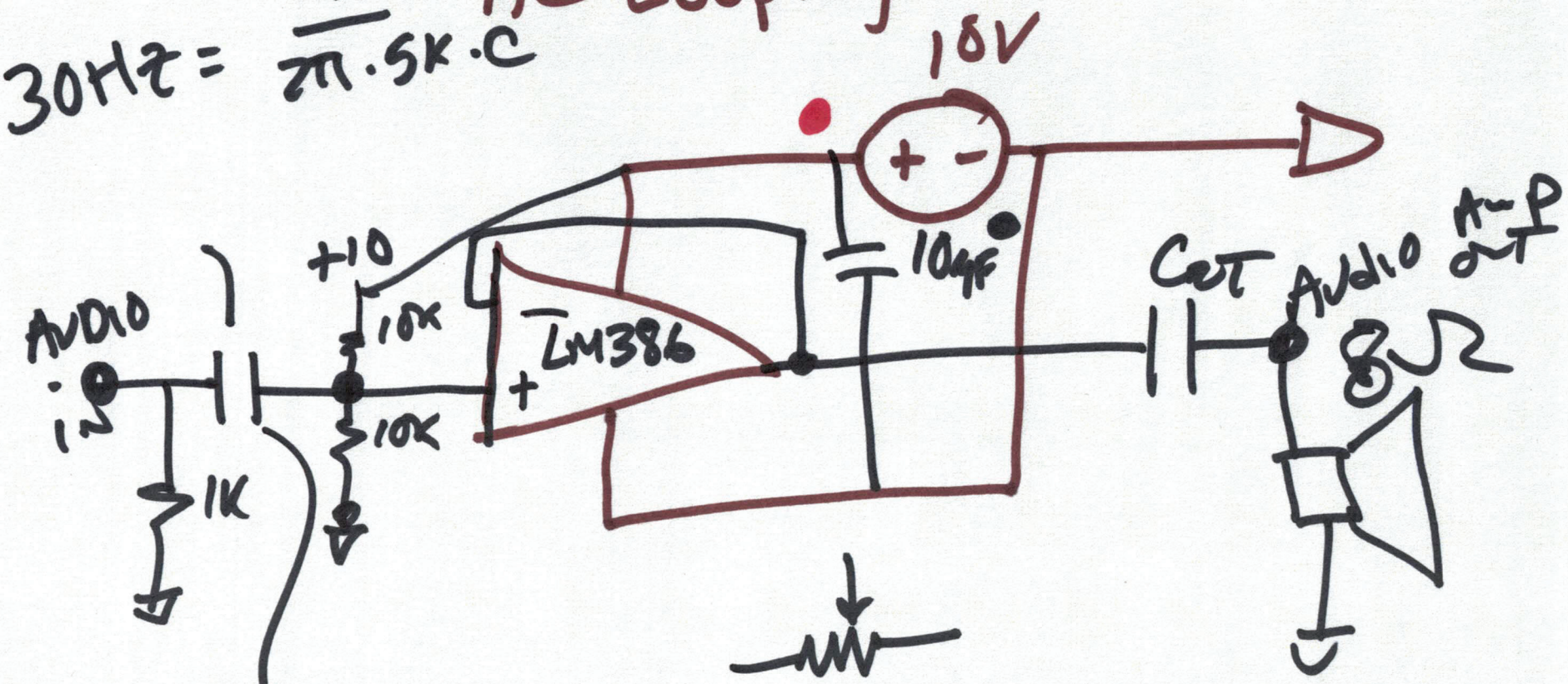
May 11, 2023

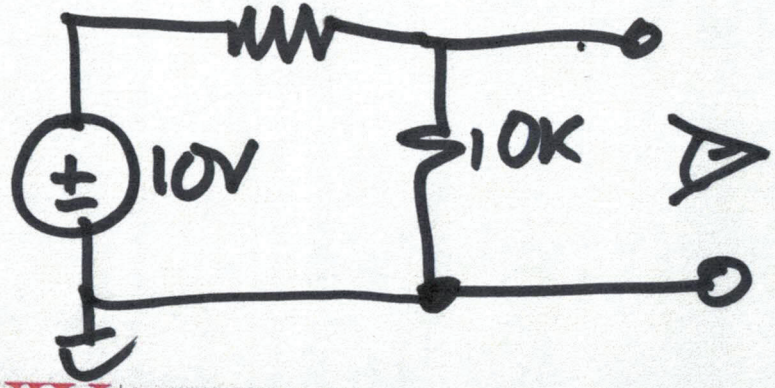





+5V
Hi-Z
Audio
in
7
6
4
-5
Buffer
VOUT = VIN
8Ω
Voltage
follower
VIN
LM486
25mA
8.25mA
200mV

$30Hz = \frac{1}{2\pi \cdot 5K \cdot C}$ AC coupling



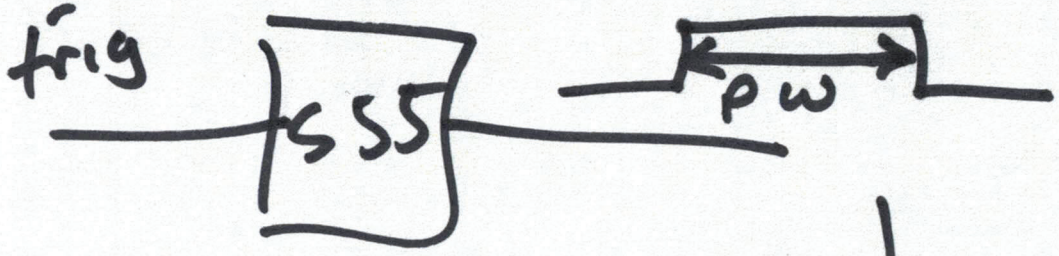


$f_{3dB} = \frac{1}{2\pi RC}$

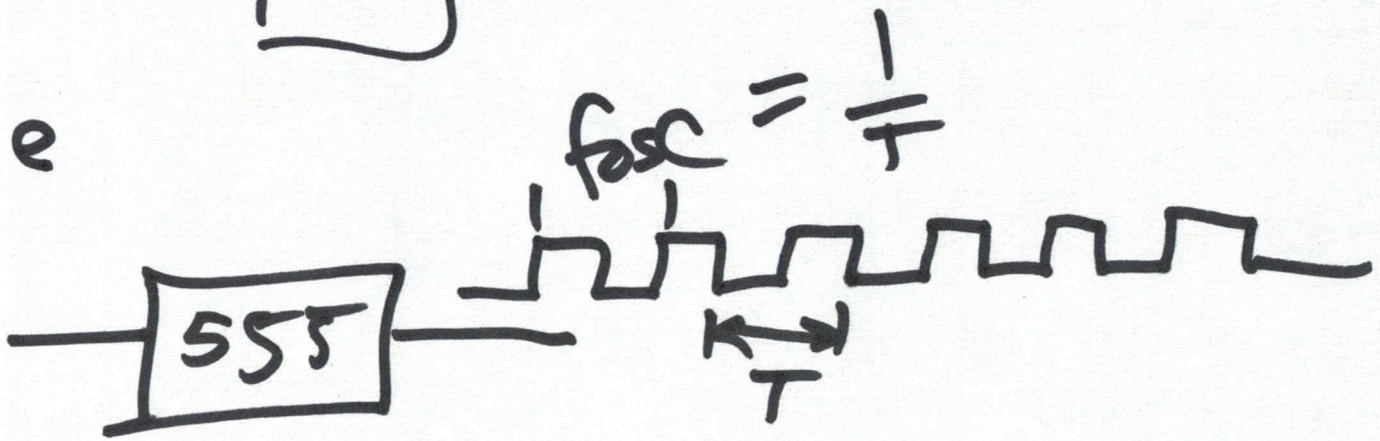
$f_{3dB} \approx 30Hz$

555

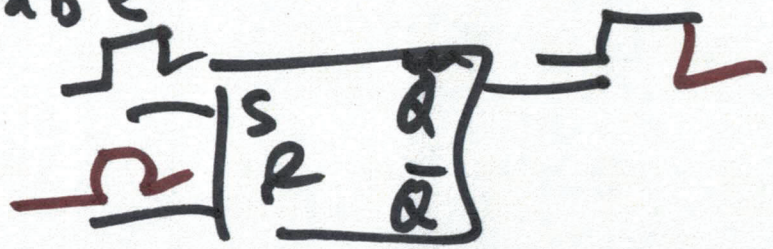
Monostable



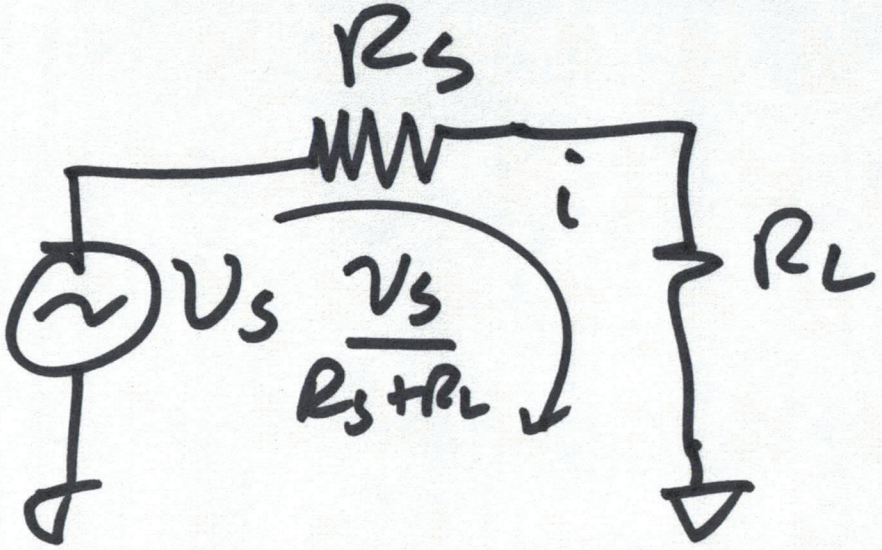
Astable



Bistable



MAXimum power



$$P_L = i^2 R_L = \left(\frac{V_S}{R_S+R_L}\right)^2 \cdot R_L$$

$$= \frac{V_S^2 \cdot R_L}{(R_S+R_L)(R_S+R_L)}$$

$$P_L = \frac{v_s^2 \cdot R_L}{R_s^2 + 2R_sR_L + R_L^2}$$

$$P_L = \frac{v_s^2}{R_s^2 \cdot R_L^{-1} + 2R_s + R_L}$$

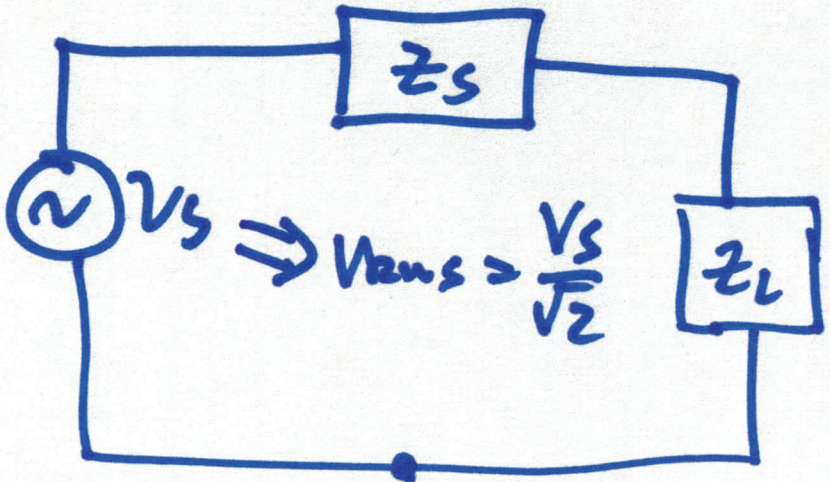
MINIMUM

$$\frac{d}{dR_L}\left(R_s^2 R_L^{-1} + 2R_s + R_L\right) = 0$$

$$(-1)R_s^{+2} R_L^{-2} \cdot 1 + 0 + 1 = 0$$

$$1 = \frac{R_s^2}{R_L^2}$$

MAX power xfer $\boxed{R_s = R_L}$

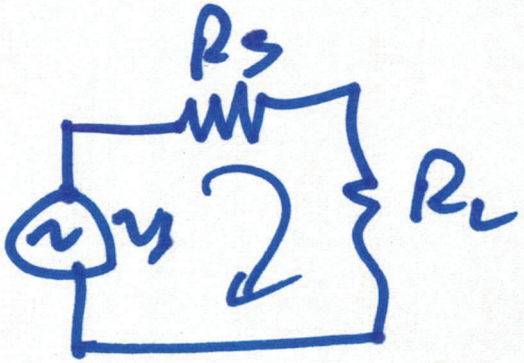


$$Z_S = R_S + jX_S$$

$$Z_L = R_L + jX_L$$

$$P = \frac{V^2}{R} = I^2 R$$

$$P_L = \frac{1}{2}\left|\frac{|V_S^*|}{|Z_S + Z_L|}\right|^2 \cdot R_L$$



current

$$\frac{V_S}{R_S + R_L}$$

$$P = I^2 \cdot R$$

$$\frac{\frac{V_S^2}{2}}{(R_S + R_L)^2}$$

$$P_L = \frac{1}{2}\frac{|V_s|^2 \cdot R_L}{|(R_s+R_L)+j(X_s+X_L)|^2}$$

MAX. power xfer

$$X_s = -X_L$$

$$\frac{1}{2}\frac{|V_s|^2 \cdot R_L}{|(R_s+R_L)^*|^2}$$

MAXimum power transfer

$$Z_s = R_s + j \cdot X_s \rightarrow Z_L = R_s + j(-X_s)$$

Load tobe the complex conjugate of the source impedance