ЕКТ 12

Задача 2) $U_{rms} = \frac{U_0}{\sqrt{2}}$ $\quad U = \sqrt{\frac{1}{T}\int_{t_1}^{t_1+T} u(t)^2\,dt}$

$u(t) = U_0 \cos(2\pi f t)$

$$U = \sqrt{\frac{1}{T}\int_{t_1}^{t_1+T} U_0^2 \cos^2(2\pi f t)\,dt}$$

$$U = \sqrt{\frac{1}{T}\int_{t_1}^{t_1+T} U_0^2 \cdot \tfrac{1}{2}(1+\cos(4\pi f t)\,dt}$$

$$U = \sqrt{\frac{1}{T}\int_{t_1}^{t_1+T} \tfrac{1}{2}U_0^2 + U_0^2\cos(4\pi f t)\,dt}$$

$$U = \sqrt{\frac{1}{T}\left[\tfrac{1}{2}U_0^2 t + U_0^2 \cdot \frac{1}{4\pi f}\cdot \sin(4\pi f t)\cdot t\right]_{t_1}^{t_1+T}}$$

$$= \sqrt{\frac{1}{T}\left(\left(\tfrac{1}{2}U_0^2(t_1+T) + U_0^2 \cdot \frac{1}{4\pi f}\cdot \sin(4\pi f(t_1+T))\cdot(t_1+T)\right)\right.}$$
$$\left.-\left(\tfrac{1}{2}U_0^2 t_1 + U_0^2\cdot\frac{1}{4\pi f}\cdot\sin(4\pi f t_1)\cdot t_1\right)\right)$$

$$= \sqrt{\frac{1}{T}\left(\tfrac{1}{2}U_0^2 T + U_0^2\,\frac{1}{4\pi f}\sin(4\pi f T)\right)}$$

$T = \frac{1}{f}$

$$= \sqrt{\tfrac{1}{2}U_0^2 + U_0^2\frac{1}{4\pi f}\sin(4\pi f T)}$$

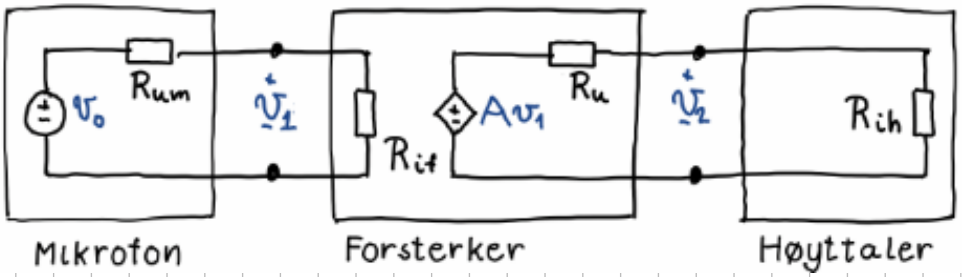
$$= \sqrt{U_0^2\left(\frac{1}{2} + \frac{1}{4\pi f}\sin(4\pi f T)\right)} \qquad T = \frac{1}{f}$$

$$= \sqrt{U_0^2\left(\frac{1}{2} + \frac{1}{4\pi f}\sin(4\pi)\right)}$$

$$= \sqrt{U_0^2\ \frac{1}{2}}$$

$$= \frac{U_0}{\sqrt{2}}$$

Oppg 4)



$v_0(t)$

$V_{0rms} = 1\ mV$

$R_{um} = 1\ k\Omega$

$R_{if} = 10\ k\Omega$

$V_{1rms} = ?$ $\quad v_1(t) = ?$

$U = R\,I$

$I = \frac{U}{R_{um} + R_{if}}$

$V_{0rms} - V_{Rum} - V_{Rif} = 0$

$V_{Rif} = V_{0rms} - V_{Rum}$

$V_{Rif} = V_{0rms} - I R_{um}$

$= V_{0rms} - \frac{V_{0rms}}{R_{um} + R_{if}} \cdot R_{um}$

$= V_{0rms}\left(1 - \frac{R_{um}}{R_{um} + R_{if}}\right)$

$V_{Rif} = 9{,}09\ e{-}4$ ✓

$V_{1rms} = \underline{9{,}09 \cdot 10^{-4}\ V}$

Oppg 5)

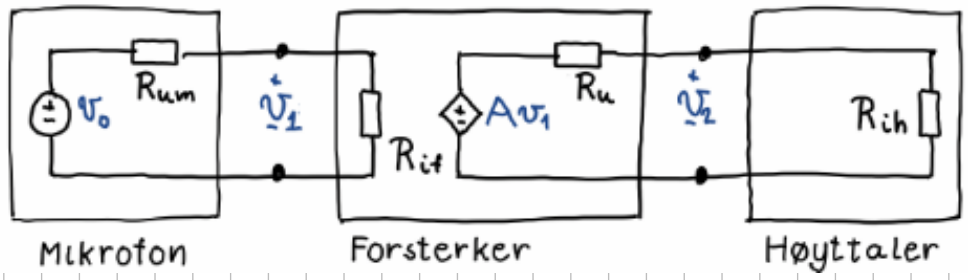
$A = 100$

$U_{2,rms} = 85\ mV$

$R_{ih} = 8\ \Omega$

$R_u = ?$

$U_{1,rms} = 9{,}04 \cdot 10^{-4}\ V$



$$AV_{1,rms} - V_{R_u} - V_{R_{ih}} = 0$$

$$V_{R_u} = AV_{1,rms} - V_{R_{ih}}$$

$$JR_u = AV_{1,rms} - V_{2,rms}$$

$$R_u = \frac{1}{J}(AV_{1,rms} - V_{2,rms}) \qquad U = RI \Rightarrow I = \frac{U}{R}$$

$$R_u = \frac{(R_{ih} + R_u)}{AV_{1,rms}}(AV_{1,rms} - V_{2,rms})$$

$$\frac{R_u}{R_{ih} + R_u} = \frac{1}{AV_{1,rms}}(AV_{1,rms} - V_{2,rms})$$

$$\frac{R_u}{R_{ih} + R_u} = 1 - \frac{V_{2,rms}}{AV_{1,rms}}$$

$$R_u = R_{ih} + R_u - \frac{V_2}{AV_1}R_{ih} - \frac{V_2}{AV_1}R_u$$

$$R_u - R_u - \frac{V_2}{AV_1}R_u = R_{ih} - \frac{V_2}{AV_1}R_{ih}$$

$$-\frac{V_2}{AV_1}R_u = R_{ih} - \frac{V_2}{AV_1}R_{ih}$$

$$R_u = -\frac{AV_1}{V_2}R_{ih} + R_{ih} = R_{ih}\left(1 - \frac{AV_1}{V_2}\right)$$

$R_u =$

Oppg 5)

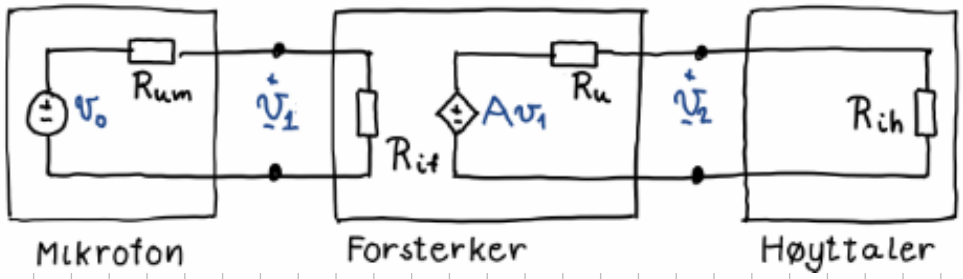
$A = 100$

$U_{2,rms} = 85\,mV$

$R_{ih} = 8\,\Omega$

$R_u = ?$

$U_{1,rms} = 9{,}04 \cdot 10^{-4}\,V$



$$U_2 = U_{R_{ih}} = Av_1 \cdot \frac{R_{ih}}{R_{ih}+R_u}$$

$U_2 > 85\,mV$

$$Av_1 \frac{R_{ih}}{R_{ih}+R_u} > 85\,mV$$

$$Av_1 R_{ih} > R_{ih} \cdot 85\,mV + R_u \cdot 85\,mV$$

$$Av_1 R_{ih} - R_{ih} \cdot 85\,mV > R_u \cdot 85\,mV$$

$$\frac{R_{ih}(Av_1 - 85\,mV)}{85\,mV} > R_u$$

$R_u < 0{,}56\,\Omega$

Ответ 6) $P = \frac{U^2}{R} = 9{,}04 \cdot 10^{-4}$ Вт