Задача 7

<table>
<tr><td>Дано:</td><td>Решение:</td></tr>
</table>

Дано:

$$s(t) = \begin{cases} 0, & w_0 t < -\dfrac{\pi}{2} \\ U_m \cos(w_0 t), & -\dfrac{\pi}{2} \le w_0 t \le \dfrac{\pi}{2} \\ 0, & w_0 t > \dfrac{\pi}{2} \end{cases}$$

Найти:

$E = ?$

$\|s\| = ?$

Решение:

$$E = \|s\|^2 = \int_{-\infty}^{+\infty} s(t)^2 dt =$$

$$= \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} U_m{}^2 \cos(w_0 t)^2 \, dt =$$

$$= U_m{}^2 \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{1 + \cos(2w_0 t)}{2} dt =$$

$$\frac{U_m{}^2}{2} \left(\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} dt + \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \cos(2w_0 t) dt \right) =$$

$$\frac{U_m{}^2}{2} \left(\pi + \frac{1}{2} (-\sin(2w_0 t)) \Big|_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \right) = \frac{U_m{}^2}{2} \pi$$

$$\|s\| = U_m \sqrt{\frac{\pi}{2}}$$