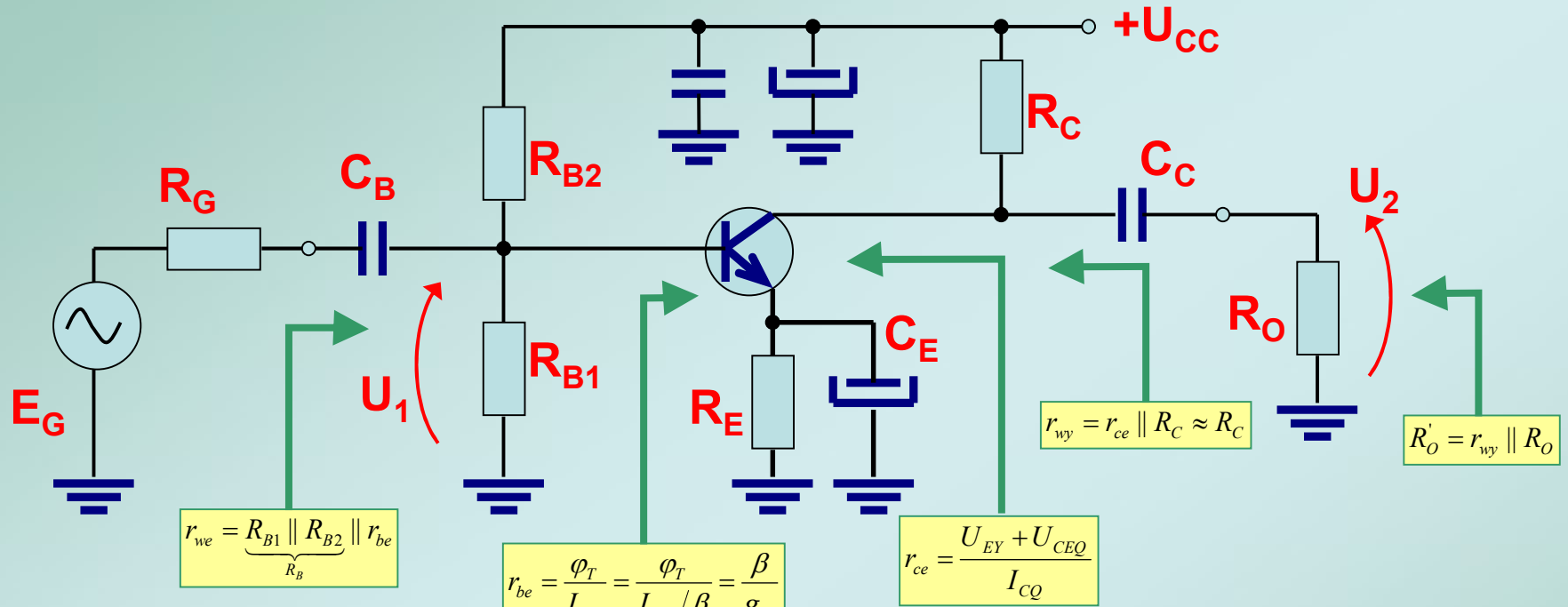


SZACOWANIE PARAMETRÓW WZMACNIACZA TRANZYSTOROWEGO ze Wspólnym Emiterem (WE)



$$r_{we} = R_{B1} \parallel R_{B2} \parallel r_{be}$$

$$r_{be} = \frac{\varphi_T}{I_{BQ}} = \frac{\varphi_T}{I_{CQ}/\beta} = \frac{\beta}{g_m}$$

$$C_{we} \approx C_{bc} |k_u| + \frac{g_m}{2\pi f_T} \approx C_{bc}$$

$$r_{ce} = \frac{U_{EY} + U_{CEQ}}{I_{CQ}}$$

$$r_{wy} = r_{ce} \parallel R_C \approx R_C$$

$$R'_O = r_{wy} \parallel R_O$$

DANE:

- $\varphi_T \approx 26mV$
 - $U_{EY} \approx 50 \div 300V$
 - U_{CEQ}, I_{CQ} – pkt.pracy
 - β
 - f_T
 - C_{bc}
 - $r_{bb'}$ dla m.cz. = 0
- } z katalogu

CZĘSTOTLIWOŚCI GRANICZNE WZMOCNIENIA SKUTECZNEGO:

WZMOCNIENIE SKUTECZNE:

$$k_{usk} = \frac{U_2}{E_G} = \underbrace{\frac{r_{we}}{r_{we} + R_G}}_{\gamma_{wej}} \cdot \underbrace{\frac{I_{CQ}}{\varphi_T}}_{g_m = \frac{\beta}{r_{be}}} \cdot \underbrace{r_{wy} \cdot \frac{R_O}{R_O + r_{wy}}}_{\gamma_{wyj}}$$

$$k_u = \frac{U_2}{U_1}$$

$$R'_O = R_O \parallel r_{wy}$$

$$f_g = \frac{1}{2\pi C_{we} ((R_G + r_{bb'}) \parallel r_{we})}$$

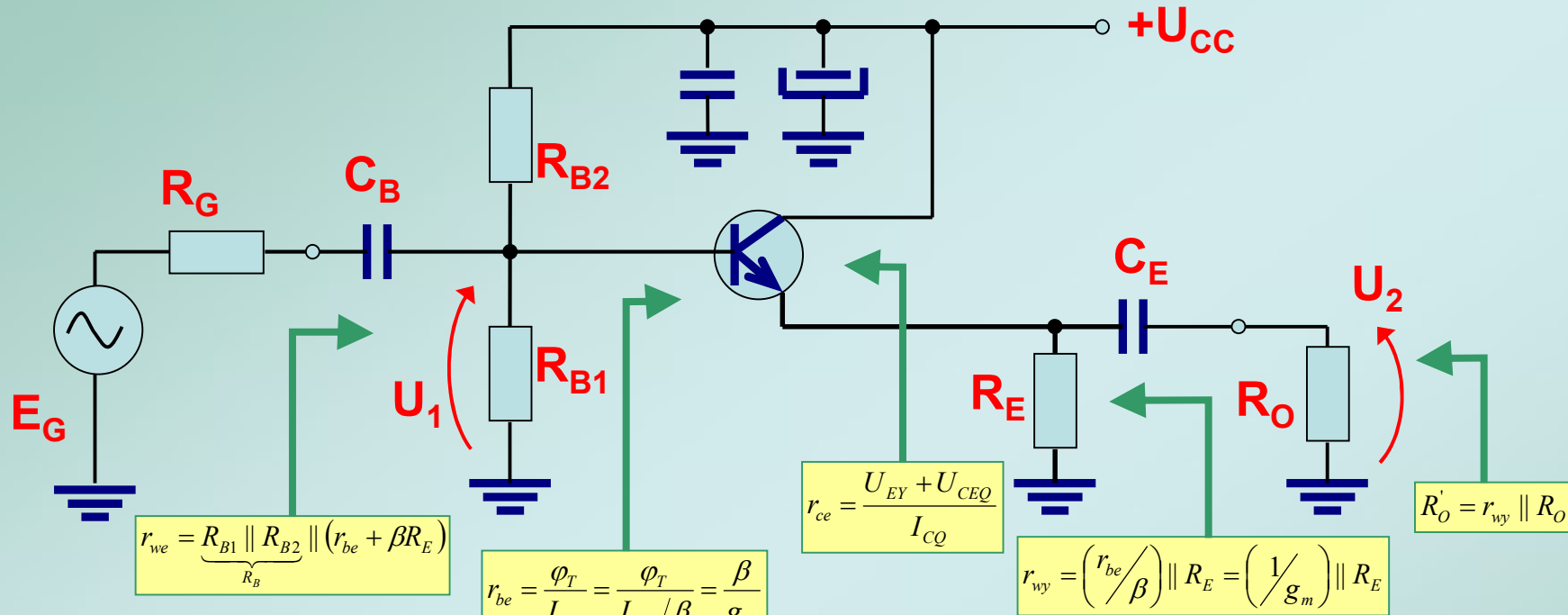
$$f_d = \sqrt{f_{d1}^2 + f_{d2}^2 + f_{d3}^2}$$

$$f_{d1}(C_B) = \frac{1}{2\pi C_B (R_G + r_{we})}$$

$$f_{d2}(C_C) = \frac{1}{2\pi C_C (R_L + r_{wy})}$$

$$f_{d3}(C_E) = \frac{1}{2\pi C_E \left[R_E \parallel \left(\frac{(R_G \parallel R_B + r_{be})}{\beta} \right) \right]}$$

SZACOWANIE PARAMETRÓW WZMACNIACZA TRANZYSTOROWEGO ze Wspólnym Kolektorem (WK)



$$r_{we} = R_{B1} \parallel R_{B2} \parallel (r_{be} + \beta R_E)$$

$$r_{be} = \frac{\varphi_T}{I_{BQ}} = \frac{\varphi_T}{I_{CQ}/\beta} = \frac{\beta}{g_m}$$

$$C_{we} \approx C_{bc} + \frac{g_m}{2\pi f_T} \approx C_{bc}$$

$$r_{ce} = \frac{U_{EY} + U_{CEQ}}{I_{CQ}}$$

$$r_{wy} = \left(\frac{r_{be}}{\beta} \right) \parallel R_E = \left(\frac{1}{g_m} \right) \parallel R_E$$

$$R'_O = r_{wy} \parallel R_O$$

DANE:

- $\varphi_T \approx 25mV$
 - $U_{EY} \approx 50 \div 300V$
 - U_{CEQ}, I_{CQ} – pkt.pracy
 - β
 - f_T
 - C_{bc}
 - $r_{bb'}$ dla m.cz. = 0
- } z katalogu

CZĘSTOTLIWOŚCI GRANICZNE WZMOCNIENIA SKUTECZNEGO:

WZMOCNIENIE SKUTECZNE:

$$k_{usk} = \frac{U_2}{E_G} = \frac{r_{we}}{r_{we} + R_G} \cdot \frac{I_{CQ}}{\varphi_T} \cdot r_{wy} \cdot \frac{R_O}{R_O + r_{wy}}$$

$$k_u = \frac{U_2}{U_1} \approx \frac{R_E \parallel R_O}{R_E \parallel R_O + 1/g_m}$$

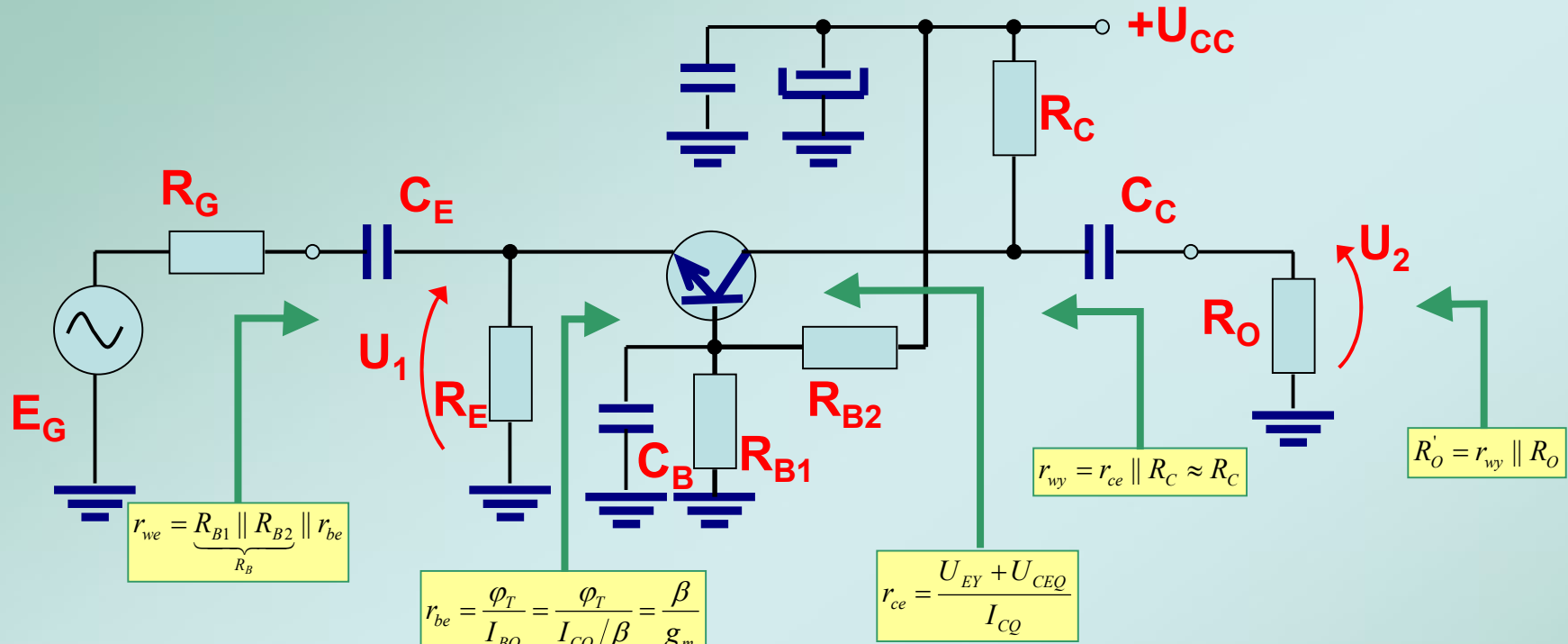
$$f_g = \frac{1}{2\pi C_{we} ((R_G + r_{bb'}) \parallel r_{we})}$$

$$f_d = \sqrt{f_{d1}^2 + f_{d2}^2}$$

$$f_{d1}(C_B) = \frac{1}{2\pi C_B (R_G + r_{we})}$$

$$f_{d2}(C_C) = \frac{1}{2\pi C_C (R_L + r_{wy})}$$

SZACOWANIE PARAMETRÓW WZMACNIACZA TRANZYSTOROWEGO ze Wspólną Bazą (WB)



$$r_{we} = \underbrace{R_{B1} \parallel R_{B2}}_{R_B} \parallel r_{be}$$

$$r_{be} = \frac{\varphi_T}{I_{BQ}} = \frac{\varphi_T}{I_{CQ}/\beta} = \frac{\beta}{g_m}$$

$$C_{we} \approx \frac{g_m}{2\pi f_T} \approx C_{be}$$

$$r_{ce} = \frac{U_{EY} + U_{CEQ}}{I_{CQ}}$$

$$r_{wy} = r_{ce} \parallel R_C \approx R_C$$

$$R'_O = r_{wy} \parallel R_O$$

DANE:

- $\varphi_T \approx 26mV$
 - $U_{EY} \approx 50 \div 300V$
 - U_{CEQ}, I_{CQ} – pkt.pracy
 - β
 - f_T
 - C_{bc}
 - $r_{bb'}$ dla m.cz. = 0
- } z katalogu

CZĘSTOTLIWOŚCI GRANICZNE WZMOCNIENIA SKUTECZNEGO:

WZMOCNIENIE SKUTECZNE:

$$k_{usk} = \frac{U_2}{E_G} = \underbrace{\frac{r_{we}}{r_{we} + R_G}}_{\gamma_{wej}} \cdot \underbrace{\frac{I_{CQ}}{\varphi_T}}_{g_m = \frac{\beta}{r_{be}}} \cdot \underbrace{r_{wy} \cdot \frac{R_O}{R_O + r_{wy}}}_{\gamma_{wyj}} = \underbrace{\frac{U_2}{U_1}}_{k_u} \cdot \underbrace{\frac{R'_O}{R_O}}_{\gamma_{wyj}}$$

$$f_g = \frac{1}{2\pi C_{we} ((R_G + r_{bb'}) \parallel r_{we})}$$

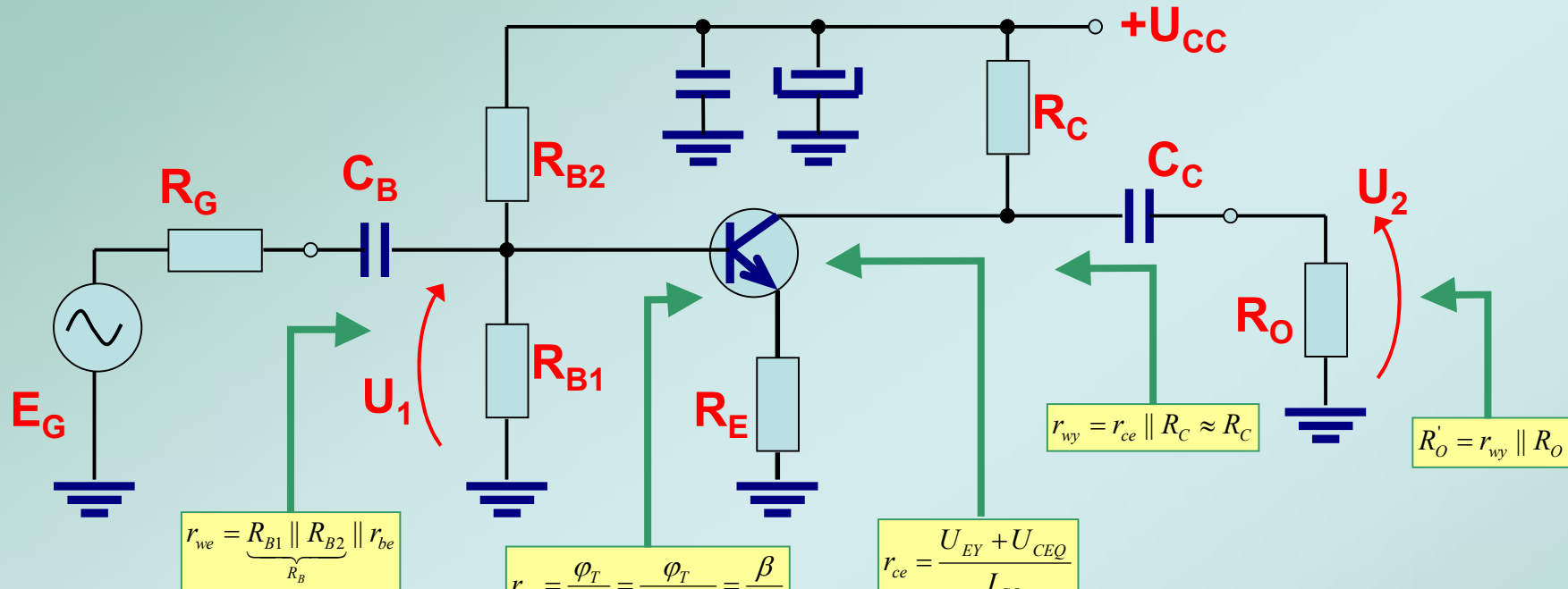
$$f_d = \sqrt{f_{d1}^2 + f_{d2}^2 + f_{d3}^2}$$

$$f_{d1}(C_B) = \frac{1}{2\pi C_B (R_G + r_{we})}$$

$$f_{d2}(C_C) = \frac{1}{2\pi C_C (R_L + r_{wy})}$$

$$f_{d3}(C_E) = \frac{\beta}{2\pi C_E (R_G \parallel R_B + r_{be})}$$

SZACOWANIE PARAMETRÓW WZMACNIACZA TRANZYSTOROWEGO ze sprzężeniem zwrotnym



$$r_{we} = R_{B1} \parallel R_{B2} \parallel r_{be}$$

$$r_{be} = \frac{\varphi_T}{I_{BQ}} = \frac{\varphi_T}{I_{CQ}/\beta} = \frac{\beta}{g_m}$$

$$C_{we} \approx C_{bc} |k_u| + \frac{g_m}{2\pi f_T} \approx C_{bc}$$

$$r_{ce} = \frac{U_{EY} + U_{CEQ}}{I_{CQ}}$$

$$r_{wy} = r_{ce} \parallel R_C \approx R_C$$

$$R'_O = r_{wy} \parallel R_O$$

DANE:

- $\varphi_T \approx 26mV$
 - $U_{EY} \approx 50 \div 300V$
 - U_{CEQ}, I_{CQ} – pkt.pracy
 - β
 - f_T
 - C_{bc}
 - $r_{bb'}$ dla m.cz. = 0
- } z katalogu

CZĘSTOTLIWOŚCI GRANICZNE WZMOCNIENIA SKUTECZNEGO:

WZMOCNIENIE SKUTECZNE:

$$k_{usk} = \frac{U_2}{E_G} = \underbrace{\frac{r_{we}}{r_{we} + R_G}}_{\gamma_{wej}} \cdot \underbrace{\frac{I_{CQ}}{\varphi_T}}_{g_m = \frac{\beta}{r_{be}}} \cdot \underbrace{r_{wy} \cdot \frac{R_O}{R_O + r_{wy}}}_{\gamma_{wyj}}$$

$$R'_O = R_O \parallel r_{wy}$$

$$k_u = \frac{U_2}{U_1} \approx \frac{R_O \parallel r_{wy}}{R_E}$$

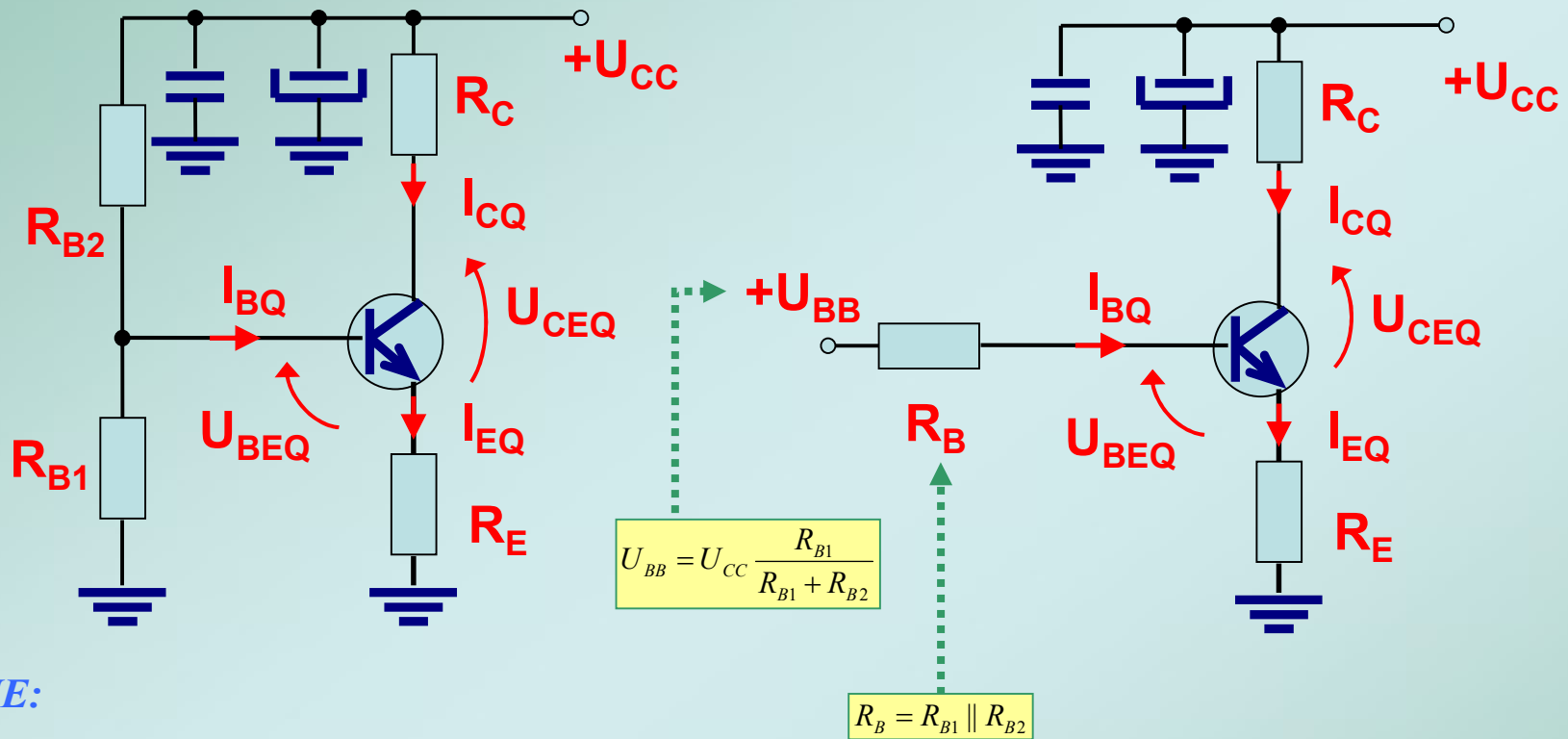
$$f_g = \frac{1}{2\pi C_{we} ((R_G + r_{bb'}) \parallel r_{we})}$$

$$f_d = \sqrt{f_{d1}^2 + f_{d2}^2 + f_{d3}^2}$$

$$f_{d1}(C_B) = \frac{1}{2\pi C_B (R_G + r_{we})}$$

$$f_{d2}(C_C) = \frac{1}{2\pi C_C (R_L + r_{wy})}$$

SZACOWANIE PUNKTU PRACY WZMACNIACZA TRANZYSTOROWEGO



DANE:

$$U_{BEQ} \approx 0,65V$$

β

$$\left. \begin{aligned} U_{BB} - I_{BQ}R_B &= I_{EQ}R_E + U_{BEQ} \\ I_{EQ}R_E + U_{CEQ} + I_{CQ}R_C &= U_{CC} \\ I_{CQ} &= \beta I_{BQ} \\ I_{EQ} &= I_{CQ} + I_{BQ} \end{aligned} \right\} \Rightarrow \left\{ \begin{aligned} I_{CQ} &= \beta I_{BQ} = \beta \frac{U_{BB} - U_{BEQ}}{R_B + (\beta + 1)R_E} \\ U_{CEQ} &= U_{CC} - I_{CQ} \left(R_E + \frac{\beta + 1}{\beta} R_C \right) \approx U_{CC} - I_{CQ} (R_E + R_C) \end{aligned} \right.$$