REŠENJA

1. a)

$$U_X' = U_X(I_{G1} \neq 0, I_{G2} = 0, U_{G1} = 0, U_{G2} = 0) = 0$$

$$U_X'' = U_X(I_{G1} = 0, I_{G2} \neq 0, U_{G1} = 0, U_{G2} = 0) = -\frac{1}{2}RI_{G2}$$

$$U_X''' = U_X(I_{G1} = 0, I_{G2} = 0, U_{G1} \neq 0, U_{G2} = 0) = 0$$

$$U_X'''' = U_X(I_{G1} = 0, I_{G2} = 0, U_{G1} = 0, U_{G2} \neq 0) = \frac{1}{2}U_{G2}$$

$$U_{OUT} = U_X' + U_X'' + U_X''' + U_X'''' = \frac{1}{2}U_{G2} - \frac{1}{2}RI_{G2}$$

b)

$$P = \frac{(U_X - U_{G2})^2}{R} = \frac{(U_{G2} + RI_{G2})^2}{4R}$$

2.

$$R_{AB} = \frac{R_1 + R_3}{\beta + 1}$$

3.

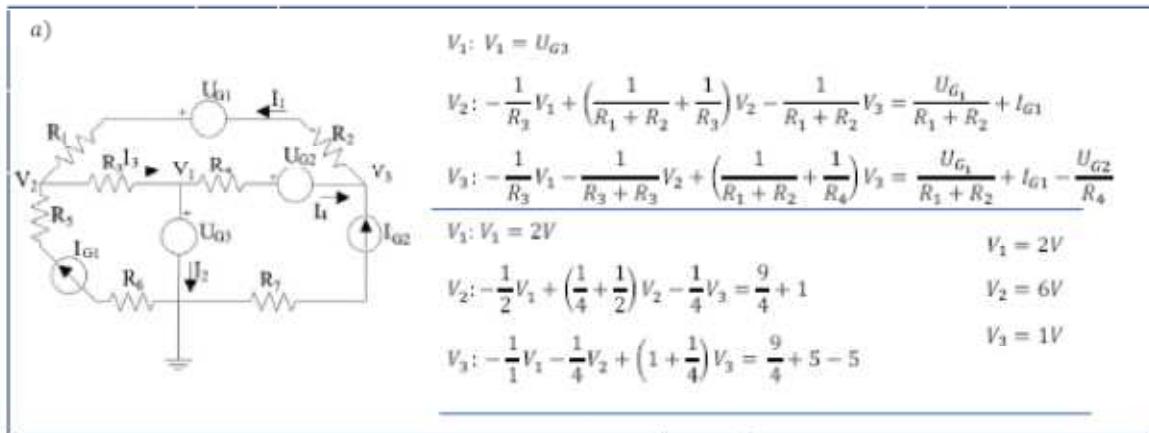a) $\underline{U_1} = (-1 + j)\text{V}$

b) $\underline{I_2} = (j2)\text{A}$

c) $u_3(t) = 5\sqrt{2}\text{V} \cdot \cos(20000\pi t - 53.13°)$

d) $i_4(t) = \sqrt{10}\text{A} \cdot \cos(20000t + 243.43°)$

4.

a)

$V_1: V_1 = U_{G3}$

$V_2: -\dfrac{1}{R_3}V_1 + \left(\dfrac{1}{R_1+R_2}+\dfrac{1}{R_3}\right)V_2 - \dfrac{1}{R_1+R_2}V_3 = \dfrac{U_{G_1}}{R_1+R_2}+I_{G1}$

$V_3: -\dfrac{1}{R_3}V_1 - \dfrac{1}{R_3+R_3}V_2 + \left(\dfrac{1}{R_1+R_2}+\dfrac{1}{R_4}\right)V_3 = \dfrac{U_{G_1}}{R_1+R_2}+I_{G1}-\dfrac{U_{G2}}{R_4}$

$V_1: V_1 = 2V$

$V_2: -\dfrac{1}{2}V_1 + \left(\dfrac{1}{4}+\dfrac{1}{2}\right)V_2 - \dfrac{1}{4}V_3 = \dfrac{9}{4}+1$

$V_3: -\dfrac{1}{1}V_1 - \dfrac{1}{4}V_2 + \left(1+\dfrac{1}{4}\right)V_3 = \dfrac{9}{4}+5-5$

$V_1 = 2V$

$V_2 = 6V$

$V_3 = 1V$

b)

$I_4 = I_1 - I_{G_2} = -4A;\ I_2 = I_{G_1}+I_{G_2} = 6A$

$I_1 = \dfrac{(V_3 + U_{G1})-V_2}{R_1+R_2} = 1A;\ I_3 = \dfrac{V_2-V_1}{R_3} = I_{G1}+I_1 = 2A$

c)

$P_{I_{G_1}} = U_{I_{G1}}I_{G_1} = 15W;\ U_{I_{G1}} = V_2 + I_{G_1}(R_5+R_6) = 15V$

$P_{I_{G2}} = U_{I_{G2}}I_{G_2} = 80W;\ U_{I_{G2}} = V_3 - \left(-I_{G_2}R_7\right) = 16V$

$P_{U_{G1}} = U_{G_1}I_1 = 9W;\ P_{U_{G2}} = U_{G_2}(-I_4) = 20W;\ P_{U_{G3}} = U_{G_3}(-I_2) = -12W;$

5.

a)

$V_1: \left(\dfrac{1}{R_1}+\dfrac{1}{R_2}+\dfrac{1}{R_5}+\dfrac{1}{R_4+R_6}\right)V_1 = \dfrac{U_{G_1}}{R_1}+I_{G1}+\dfrac{U_{G2}}{R_4+R_6}$

$V_1: V_1 = \dfrac{11}{7}V = U_{AB} = E_T$

$\dfrac{1}{R_T} = \left(\dfrac{1}{R_1}+\dfrac{1}{R_2}+\dfrac{1}{R_5}+\dfrac{1}{R_4+R_6}\right)$

$R_T = \dfrac{6}{7}\Omega$

b)

$I_X = \dfrac{E_T}{R_T+R_7+R_8} = \dfrac{11}{34}A$