Written exam– UNOFFICIAL TRANSLATION
at courses
ELEKTRONSKI ELEMENTI
2. year - Electronics - VSP
6. 4. 2001

1. For non-linear duopoly we have analytical relationship: $i = a \cdot u + b \cdot u^2$. Determine the differential resistance at connected bias voltage $U = 1$ V.

   $a=$ 1 A/V
   $b=$ 5 A/V^2

2. At $T = 300$ K we measure junction capacitance of silicon p^+n diode at two reverse voltages: $C_T(U_{RI} = 1$ V$)= 7.0$ pF and $C_T(U_{RI} = 2$ V$)= 5.8$ pF. Write analytical expression for $C_T(U_R)$ and determine the junction capacitance at the short-circuit and potency factor n, if the diode has step pn junction with $N_A = 10^{18}$ cm^{-3} in p-layer and $N_D = 10^{14}$ cm^{-3} in n-layer.

3. For depicted circuit specify the load resistance R_C so that at the bias base current of $I_B=30$ μA the output voltage is $U_{CE}=2$ V. Draw operating line with the operating point in the attached output characteristic of a bipolar transistor and enter the values of base currents for each curve.
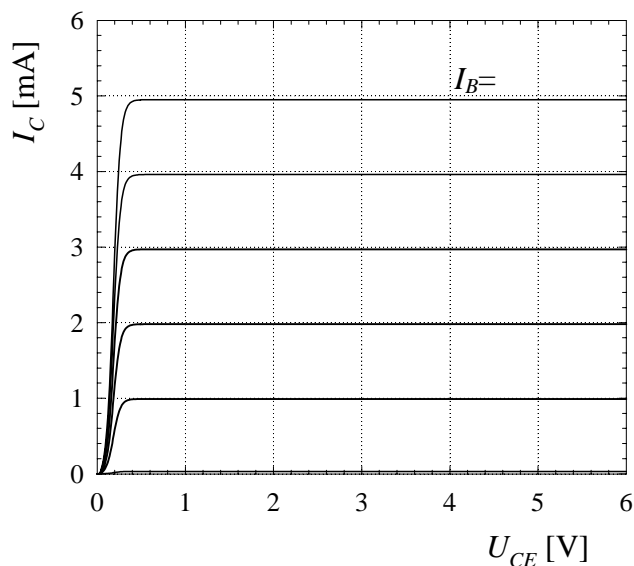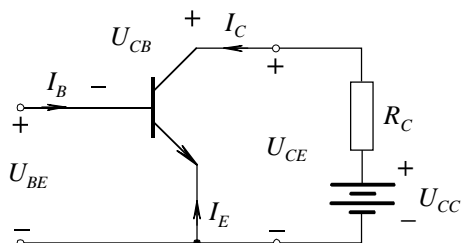
4. For a MOSFET with a built-in p-channel draw symbol, cross-section of the structure and a sketch of the family of output curves $i_D(u_{DS}, u_{GS})$. Draw the energy band diagram over the semiconductor
   a) for the situation without the connected voltage and
   b) for the conditions of reduced channel.