Student ID:_____**Student Name:** _____

EHB222E INTRODUCTION TO ELECTRONICS (11483-11359-11360-11443)

Midterm Exam 2 ✎ 10 December 2019 🕓 18.00-20.00

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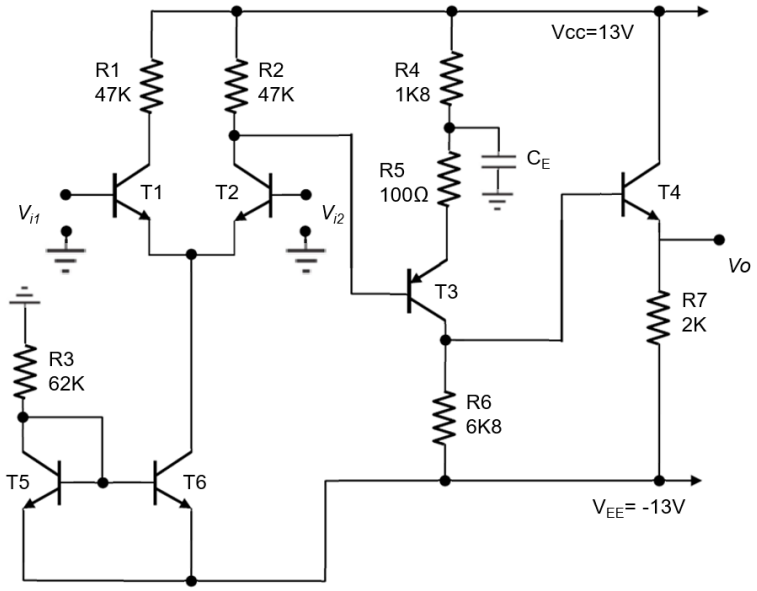


1. All the transistors are identical in the circuit shown on the left. Parameters are:

$V_A = \infty$, V_T = 25 mV, $|V_{BE}|$ = 0,6V, and $h_{FE} = h_{fe} = \beta = 250$.

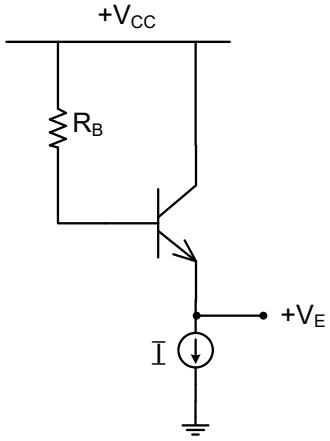
a. Calculate operating point currents of all transistors (25 points)

b. Calculate total voltage gain, r_i input impedance, r_o output impedance and CMRR (Common Mode Rejection Ratio) of the differential amplifier (1st stage). (35 points)

Note: Write the values you find in the relevant places shown below.

a) $I_{C5} = I_{C6}$ = 0,2 mA $I_{C1} = I_{C2}$ = 0,1 mA I_{C3} = 1,96 mA. I_{C4} = 6,25 mA

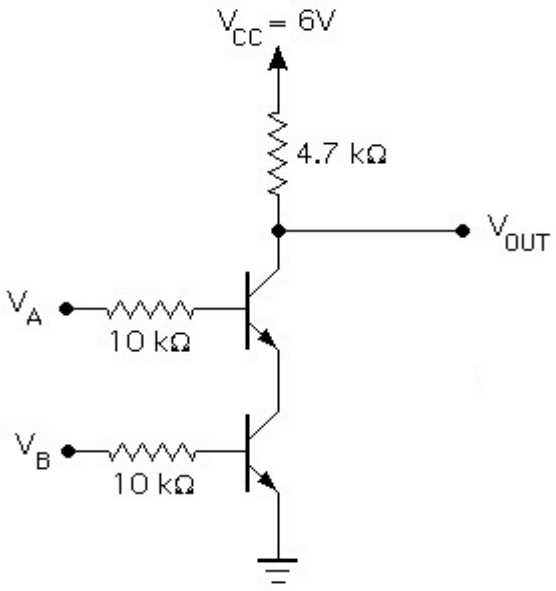
b) r_i = 125 k r_o = 30,7 Ω A_v = 2093,2 CMRR = .∞



2. Parameters of the transistor shown on the left are: $I_S = 10^{-15}$A, h_{fe} = 100. Circuit parameters: V_{CC} = 10 V, I = 5mA

If $V_E = 0.7V_{CC}$, calculate the value of the R_B resistance. (20 points)

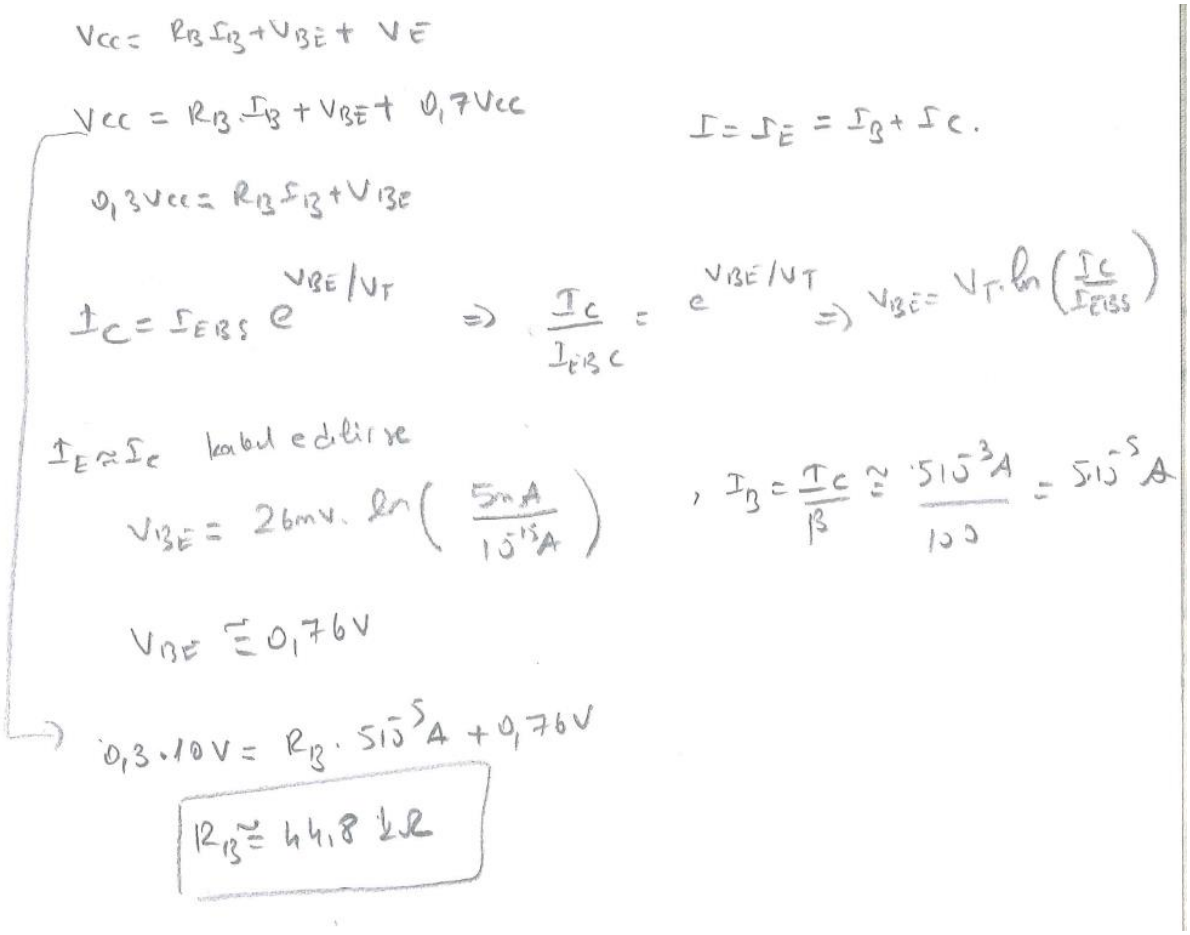
3. Build the truth table of the logic gate shown on the right. LOGIC 0 = 0 V, LOGIC 1 = 6 V. What GATE is this circuit? Write down your analysis and why you decided this is a _____ gate? (20 points)



GOOD LUCK EVERYONE

SOLUTIONS

2.



3. It is a NAND gate: http://vlsi-design-engineers.blogspot.com/2015/07/bjt-based-logic-gates.html