1. Consider an op-amp having f_t = 1 MHz, R_{id} = 1 MΩ, and R_{icm} = 100 MΩ. Find the input impedance of a noninverting amplifier with a nominal gain of 100. Assuming that
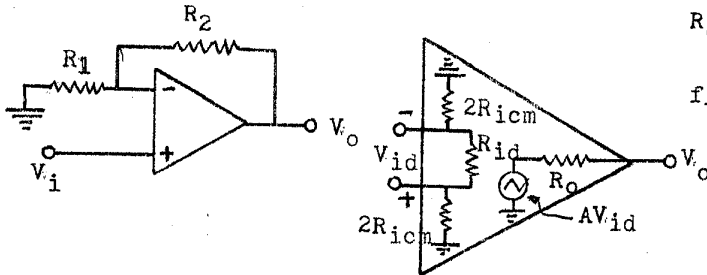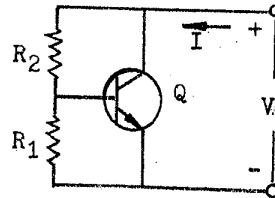
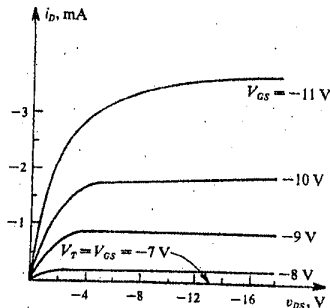$R_0 = 0$, $R_1 \ll R_{icm}$, $\dfrac{R_2}{R_{id}} \ll A$.

f_t : unity-gain bandwidth.

(20%)

2. In the circuit as shown. Find the values of V and the incremental resistance for $R_1 = R_2$ = 1KΩ. I = 10 mA. β = 100. and V_{BE} = 0.7 V. (20%)
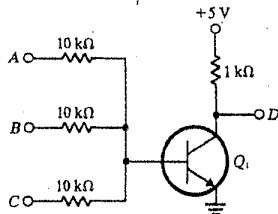

3. Employing the MOSFET characteristic curves of Figure, show how saturated drain current values I_{DSS} can be obtained and from them other I_{DS} drain current values in saturation. (20%)

4. Prove that the circuit of the Figure is a NOR gate. Ignore the V_{BE} drop, leakage currents, and V_{CES} and assume $\beta \geq 50$, 0V and 5V logic levels, and no external loading. (20%)

5. Design a collector-coupled flip-flop using transistors with $\beta \geq 20$. Assume V_{CC}=+10V and obtain a minimum high-level output voltage of 9V. Ignore V_{BES} and V_{CES} drops. (20%)