Prob. 1-3: Find the expression for small signal $R_{in}$, $Gm$, $R_{out}$ and Gain for all the circuits. Assume all the BJTs are biased in forward active region and MOSFETs in saturation. Consider $ro = \infty$

**Prob.1**

![Circuit Diagram](image)
ECE 323 HW # 3

(c)  

(d)
Prob. 2

(a)

(b)
Prob. 3

(a)
Prob. 4
For the circuit given below, find the expression for output resistance $R_{out}$, transimpedance $V_{out}/I_{in}$ and current gain $I_{z}/I_{in}$. Assume all the MOSFETs having same W/L and operating in saturation region. Consider $r_0 = \infty$. 
**Prob. 5**
For the circuit given below, find the expression for $R_{in}$, $R_{out}$, $G_m$ and gain. Assume all the MOSFETs operating in saturation region and consider $r_o = \infty$. Plot the behavior of output gain vs $R_2$. 

![Circuit Diagram]
Prob. 6
Find Req2 and Req3

Req2 = ?

Req3 = ?
Prob. 7
Find the input-to-output small-signal gain.