PESIT-BSC

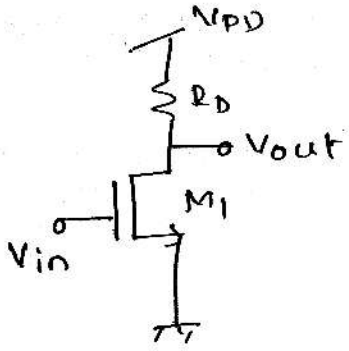
Dept. of ECE

1st-Test (scheme and solution)

(M.Tech. 2nd SEM) SUB: AMVD.

Faculty: Muralidhar.s

D.a.



$V_{out} = -g_m \cdot R_D \cdot v_{in}$

OR

$V_{out} = V_{DD} - I_{D\,sat} \cdot R_D$

$\therefore V_{in} - V_{TH} = V_{DD} - I_{D\,sat} \cdot R_D$

$= 10 - \frac{1}{2}\{(10^{-4}) \cdot (V_{ov})^2\} 10^5$

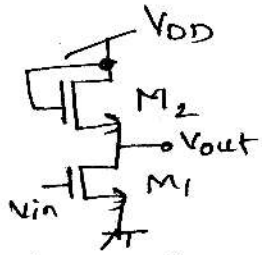
$\therefore V_{ov} = 1.3177V = V_{in} - V_{TH}$

$\therefore V_{in} = 2.734$

$\therefore$ Range is $\boxed{1.42V \leq V_{in} \leq 2.734}$ — (8 M)

(2) second order effects in MOS Device (Refer class-notes) → 04 X 02M → (8M)

(2) $A_V = \frac{-g_{m1}}{g_{m2}}$



$\therefore I_{D1} = I_{D2}$, $\Rightarrow$ $A_V = \left(\frac{V_{gs2} - V_{TH2}}{V_{gs1} - V_{TH1}}\right)$

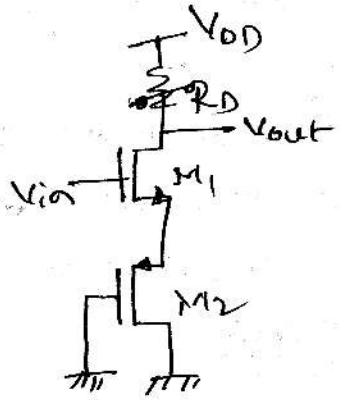
(P.T.O)

$$\frac{V_{gs2} - V_{TH2}}{\underbrace{V_{gs1} - V_{TH1}}_{V_{in}}} = \sqrt{5}$$

— (8M)

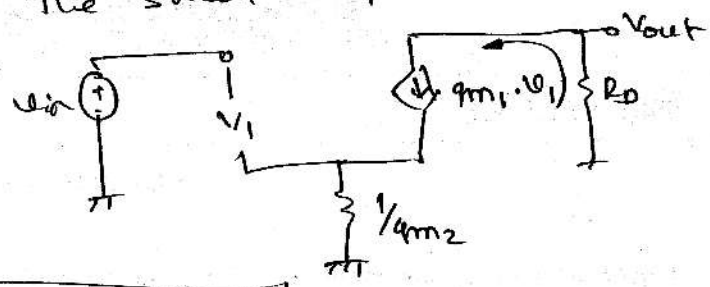
$\therefore$ **$V_{in} = 1.44V$** → To keep the device at the edge of the triode region.

(4)



M_2 is diode connected thence the impedance is $\frac{1}{g_{m2}}$

The small signal model is



$$A_V = \frac{-g_{m1} R_{1D}}{1 + \frac{g_{m1}}{g_{m2}}}$$

— (8M)

(5) I_D expression of MOS device, → (Refer. class-notes)

$$I_D = \mu_n . C_{ox} . \frac{W}{L} \left\{ (V_{gs} - V_{TH}) V_{DS} - \frac{V_{DS}^2}{2} \right\} \rightarrow L.R.$$ — (3M)

$$I_D = \frac{1}{2} \mu_n . C_{ox} \frac{W}{L} (V_{gs} - V_{TH})^2 \rightarrow S.R. \rightarrow (3M)$$

$$g_m = \mu_n . C_{ox} \frac{W}{L} (V_{gs} - V_{TH}) \rightarrow S.R \rightarrow (1M)$$

$$g_m = \mu_n . C_{ox} \frac{W}{L} . V_{DS} \rightarrow L.R. \quad — (1M)$$