3. Basic Amplifier Stages

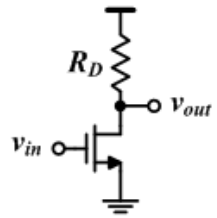
1. The multistage amplifier that gives high input impedance and low output impedance is the _____.

A	CS and CD	B	All are wrong	C	CG and CD	D	CS and CG

$$Av = G_m R_{out} = g_m \times R_D$$

The device need at least $VDS = Vov$ to work in saturation

$$A_v = \frac{2I_D}{V_{ov}} \times \frac{V_{DD} - V_{ov}}{I_D} = 2\left(\frac{V_{DD}}{V_{ov}} - 1\right)$$



2. The maximum absolute voltage gain of the shown CS amplifier can be written as _____.

A	(VDD/Vov - 1)	B	2*(VDD/Vov - 2)	C	(VDD/Vov - 2)	D	2*(VDD/Vov - 1)

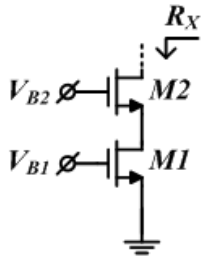
3. Assume L1 = 2*L2. Neglect body effect and VA dependence on terminal voltages. RX is approximately given by ___.

$$R_X = r_{o2}(1 + g_{m2}R_{LFD1})$$

$$R_{LFD1} = r_{o1}$$

$$\text{if } L1 = 2 * L2 \rightarrow r_{o1} = 2 * r_{o2}$$

$$R_X = r_{o2} \times g_{m2} \times 2r_{o2} = 2\, g_{m2} r_{o2}^2$$



A	2*gm2*ro2^2	B	4*gm2*ro2^2	C	gm2*ro2^2	D	0.5*gm2*ro2^2

4. The basic MOS amplifier stage that provides power gain is the _____.

A	CS	B	CG	C	CD	D	All

5. If a voltage signal has 10mV amplitude superimposed on 0.3V dc level, and it is required to shift the dc level to be 0.9V without changing the signal amplitude, then ____ amplifier should be used.

A	NMOS CS	B	PMOS CD	C	NMOS CD	D	PMOS CS

6. The basic MOS amplifier stage that practically always has absolute voltage gain < 1 is the _____.

A	CS	B	CG	C	CD	D	All are wrong

7. The multistage amplifier that gives high input impedance and high voltage gain is _____.

A	CS + CG	B	CG + CD	C	CG + CS	D	All are wrong

8. Assume Vov1 = 2*Vov2 and L1= 2*L2 . Neglect body effect and VA dependence on terminal voltages. RX is approximately given by ___.

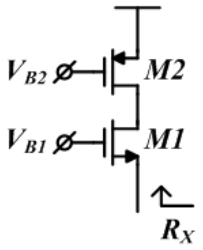
$$R_X = \frac{1}{g_{m1}}\left(1 + \frac{R_{LFD2}}{r_{o1}}\right) \text{ and } R_{LFD2} = r_{o2}$$

$$\text{if } L2 = 2 * L1 \rightarrow r_{o2} = 2 * r_{o1}$$

$$R_X = \frac{1}{g_{m1}}\left(1 + \frac{r_{o2}}{r_{o1}}\right) = \frac{3}{g_{m1}}$$

A	2*gm1*ro1^2	B	4*gm1*ro1^2	C	gm1*ro1^2	D	0.5*gm1*ro1^2

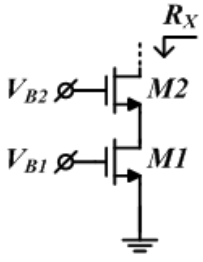
9. Assume gm*ro >> 1 and L2 = 2L1. Neglect body effect and assume VA does not depend on terminal voltages. RX is given by ___.



A	2/gm1	B	4/gm1	C	1/gm1	D	3/gm1

10. The basic MOS amplifier stage that practically always has absolute current gain < 1 is the ___.

A	CS	B	CG	C	CD	D	All are wrong



$$R_X = r_{o2}(1 + g_{m2}R_{LFD1}) \text{ and } R_{LFD1} = r_{o1}$$

$$\text{if } L1 = 2 * L2 \rightarrow r_{o1} = 2 * r_{o2} \text{ and if } V_{ov1} = 2 * V_{ov2} \rightarrow g_{m1} = \frac{1}{2}g_{m2}$$

$$R_X = \frac{r_{o1}}{2} \times 2g_{m1} \times r_{o1} = g_{m1}r_{o1}^2$$