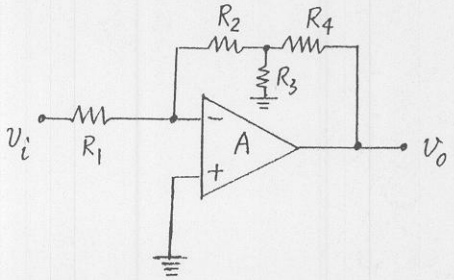
※注意：作答時，請於答案卷上標明作答之部份及其題號，並依序作答。

(第一部份)選擇題(60 分,每題 6 分,**單選**,**本部份必須於試卷上集中作答**)

1.



If A is an ideal OP AMP, the voltage gain v_o/v_i is :

(a). $-(R_2/R_1)(1+R_2/R_4+R_3/R_4)$ (b). $-(R_2/R_1)(1+R_4/R_2+R_4/R_3)$

(c). $-(R_2/R_1)(1+R_4/R_2+R_3/R_4)$ (d). $-(R_2/R_1)(1+(1/R_3)(R_2//R_4))$

(e). none of (a)~(d)

2. Which of the following parameters is a "purely" small signal characterics of an OP AMP:

(a). the slew rate(SR), (b). the power bandwidth, (c).the unity-gain bandwidth (f_t),

(d). the rise time and fall time (t_r,t_f), (e). none of (a)~(d).

3. Which of the following statements is NOT true?

(a).The small signal voltage gain of a BJT CE amplifier at low frequency is a negative real number;

(b).The BJT CB amplifier has no current gain (The current gain is smaller than unity);

(c).The output resistance of a BJT emitter follower is always smaller than r_o at low frequencies;

(d). The BJT emitter follower can be used as a buffer, and it has no power gain;

(e). All of (a),(b),(c),(d) are true

4. For the class B output stages using emitter follower, which of the following is NOT true.

(a).There is some cross-over distortion;

(b).The device power dissipation increases monotonically as output signal magnitude increases;

(c). The max. achievable efficiency is approximately 78.5%;

(d). The max. device dissipation power is proportional to V_{cc}^2;

(e).Negative feedback around the whole amplifier can be used to reduce the distortion.

5. Which statement about the "body effect" in MOSFETs is NOT true?

(a).It is due to the channel length modulation by V_{DS};

(b).For the p-MOSFETs in a modern CMOS process, it will cause their threshold voltage V_{tp} to be more negative;

(c).The transconductance g_{mb} is usually smaller than g_m due to V_{GS};

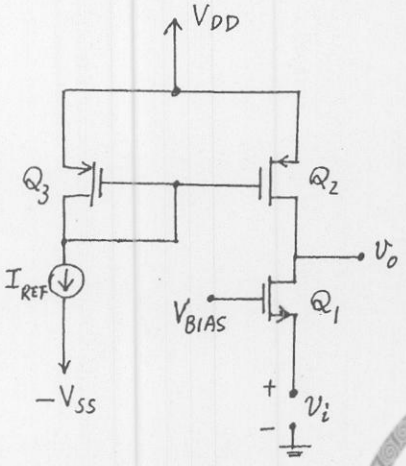
(d).In a MOS source-follower circuit, it will reduce the output resistance;

(e).All of (a),(b),(c),(d) are true.

接背面

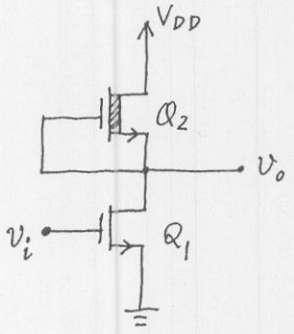
6. An OP AMP has single-pole open loop frequency response with f_t=2 MHz. It is used to build an inverting amplifier with a voltage gain of 10 dB. Then this amplifier's –3 dB (closed loop) bandwidth is approximately:
(a).200 KHz; (b).182 KHz; (c).481 KHz; (d).633 KHz; (e). 91 KHz.

7.



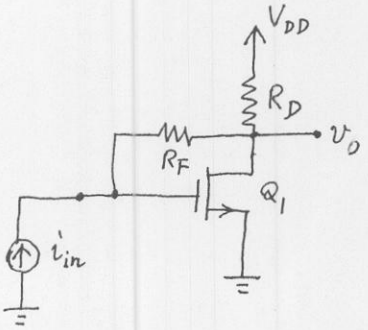
The low frequency small signal gain of this CG amplifier can be expressed as $vo/vi=(X+r_{o1}^{-1})Y$, where
(a).$X=g_{m1}$, $Y=r_{o1}//r_{o2}$;
(b).$X=(g_{m1}^{-1}//g_{m2}^{-1})^{-1}$, $Y= r_{o1}//r_{o2}$;
(c).$X= g_{m1}+ g_{m2}$, $Y= r_{o1}//r_{o2}//g_{m3}^{-1}$;
(d).$X= g_{m1}+ g_{mb1}$, $Y= r_{o1}//r_{o2}$;
(e).$X=(g_{m1}^{-1}// g_{mb1}^{-1})^{-1}$, $Y=r_{o1}//r_{o2}//g_{m3}^{-1}$;
(f). none are correct.

8.



For the circuit in which Q_2 is a depletion mode NMOSFET with $V_{t2}<0$, which of the operation modes is impossible:
(a). Q_1: OFF , Q_2:triode;
(b). Q_1:saturation , Q_2:triode;
(c). Q_1& Q_2: both saturation;
(d). Q_1:triode, Q_2: saturation;
(e). (a),(b),(c),(d) are all possible, none are impossible.

9.



For this circuit with a current source input, the input resistance "seen" by the source is (neglecting r_o of Q_1) approximately:
(a). ∞
(b). $R_F//R_D$
(c).$(R_F//R_D)/(1+g_{m1}R_D)$
(d).$(R_F+R_D)/(1+g_{m1}R_D)$
(e). $(R_F+R_D)/(1+g_{m1}R_F)$

10. For the same circuit as in Prob. 9 above, if r_o is NOT negligible, the output resistance will be
(a). $R_D//r_o$;
(b). $g_{m1}^{-1}//R_F//R_D//r_o$;
(c). $g_{m1}^{-1}//R_D//r_o$;
(d). $R_F//R_D//r_o$;
(e). none are correct.

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(第二部份)簡答題 (40 分)

1.(a).Draw the **hybrid-π** and **T-small signal models** for a BJT operating at low frequency and in the active mode. The hybrid-π model should include (r_π,g_m,r_o) and the T-model should include (r_e,α,r_o). (6 分)

(b).Express r_e and α in terms of g_m and r_π . (6 分)

2. When a BJT is operated in the forward active mode, the base current I_B is composed of two components. Describe these two components briefly. (10 分)

3.Express the small signal transconductance g_m of a MOSFET operating in saturation mode in terms of (a). I_D and W/L and (b). I_D,V_{GS} and V_t. (6 分)

4.What are the advantages of class AB output stages over
(a). Class A, and (b). Class B output stages? (6 分)

5.The cascode amplifier has better high frequency response than the simple CE(BJT) and CS(FET) amplifiers. Why? (6 分)