**Mid-Term Exam, ECE-137B**
May 12 , 2006

**Closed-Book Exam**

There are 2 problems on this exam , and you have 50 minutes.

***1) show all work. Full credit will not be given for correct answers if supporting work is not shown.***
2) please write answers in provided blanks
3) Don't Panic !
4) 137a, 137b crib sheets, and 2 pages personal sheets permitted.

# Do not turn over the cover page until requested to do so.

Name:

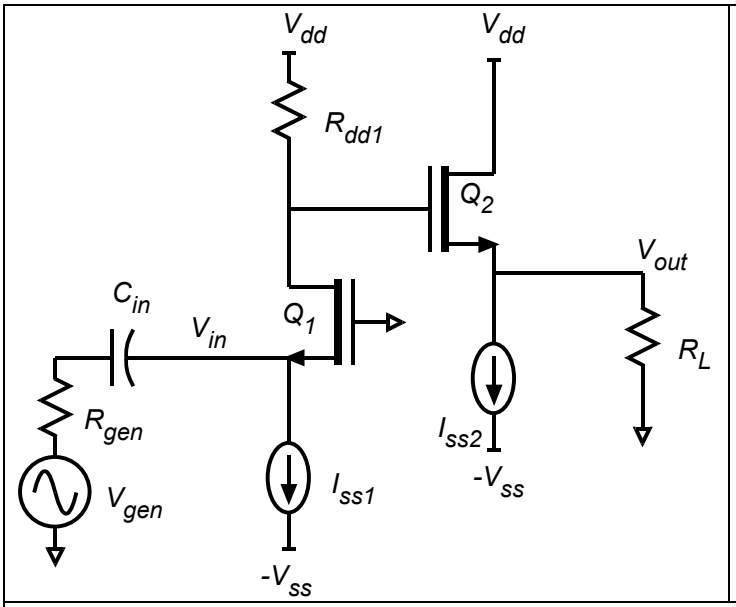
_____

Use any and all reasonable approximations. 5% accuracy is fine if the method is correct.

| Time function | LaPlace Transform |
|---|---|
| $\delta(t)$ | 1 |
| U(t) | 1/s |
| $e^{-\alpha t}U(t)$ | $\frac{1}{s+\alpha}$ |
| $e^{-\alpha t}\cos(\omega_d t)U(t)$ | $\frac{s+\alpha}{(s+\alpha)^2+\omega_d^2}$ |
| $e^{-\alpha t}\sin(\omega_d t)U(t)$ | $\frac{\omega_d}{(s+\alpha)^2+\omega_d^2}$ |

| Problem | Points Received | Points Possible |
|---|---|---|
| 1a | | 25 |
| 1b | | 25 |
| 1c | | 50 |
| total | | 100 |

**Problem 1, 100 points**




The supplies are +/- 5 Volts

Q1: $|V_{th}|$=0.5 Volt, $v_{sat}C_{ox}W_g$=5 mA/V, lambda=0, $C_{gd}=C_{gs}/5$. $f_\tau$ =80 GHz

Q2: $|V_{th}|$=0.5 Volt, $v_{sat}C_{ox}W_g$=4 mA/V, lambda=0, $C_{gd}=C_{gs}/5$. $f_\tau$ =80 GHz

Rgen=200 Ohm. RL=5 kOhm
Iss1=Iss2=1 mA

The DC output voltage is to be zero volts---Rdd1 is set accordingly
Cin is an AC short-circuit at all frequencies of interest.

Part a, 25 points

Find the following

Rdd1=_____ DC voltage at the drain of Q1= _____

$C_{gd}$ of Q1=_____ $C_{gs}$ of Q1=_____

$C_{gd}$ of Q2=_____ $C_{gs}$ of Q2=_____

Part b, 25 points

*Mid Band Analysis:*
Find the mid-band small signal voltage gain of Q2 (the small signal voltage at the source of Q2 divided by the small signal voltage at the gate of Q2)

Av2=_____

Find the mid-band small signal voltage gain of Q1 (the small signal voltage at the drain of Q1 divided by the small signal voltage at the source of Q1)

Av1=_____

Find Vin/Vgen

Vin/Vgen=_____



a

Part c:50 points

The circuit has 3 poles and one zero in its transfer function.

Give the frequencies of these in Hz:

$f_{p1}$=_____ , $f_{p2}$=_____

$f_{p3}$=_____ $f_z$=_____



a

a