



中山大学理工学院 2012 学年 1 学期期末 11 级微电子 2+2 模拟电子技术试卷 (B)

_____ 年级 _____ 专业 姓名 _____ 学号 _____

老师姓名：

考试成绩：

i. Choose the best answer (20%)

1. The majority carriers in n-type materials are____, while the majority carriers in p-type materials are____. ()

A. neutron, holes B. holes, electrons C. electrons, holes

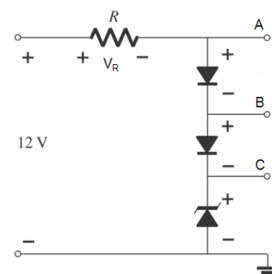
2. For the network shown below, V_R = ____.($V_D=0.7V, V_Z=6V$) ()

A. $V_R=7.4V$

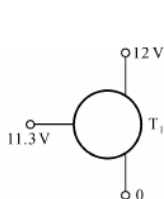
B. $V_R=4.6V$

C. $V_R=6.7V$

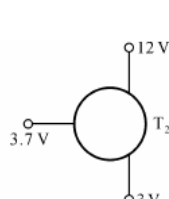
D. $V_R=9.9V$



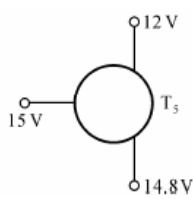
3. Which of the followings is a pnp transistor of Si? ()



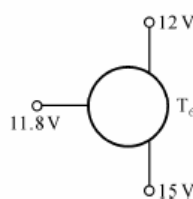
A



B



C



D

4. A transistor works at linear amplification region.if I_B increased to 20uA from 10uA and I_C increased to 1.5mA from 1mA, $\beta \approx$ _____. ()

A. 83

B. 91

C. 50

5. Which of the following statements is not correct? ()

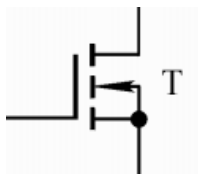
A. FETs are voltage controlled devices whereas BJTs are current controlled devices.

B. FETs have a higher input impedance, but BJTs have higher gains.

C. FETs are less sensitive to temperature variations than BJTs.

D Because of FETs' construction, they are more difficult integrated on ICs than BJTs.

6. For the FET shown below, it is a_____ ()



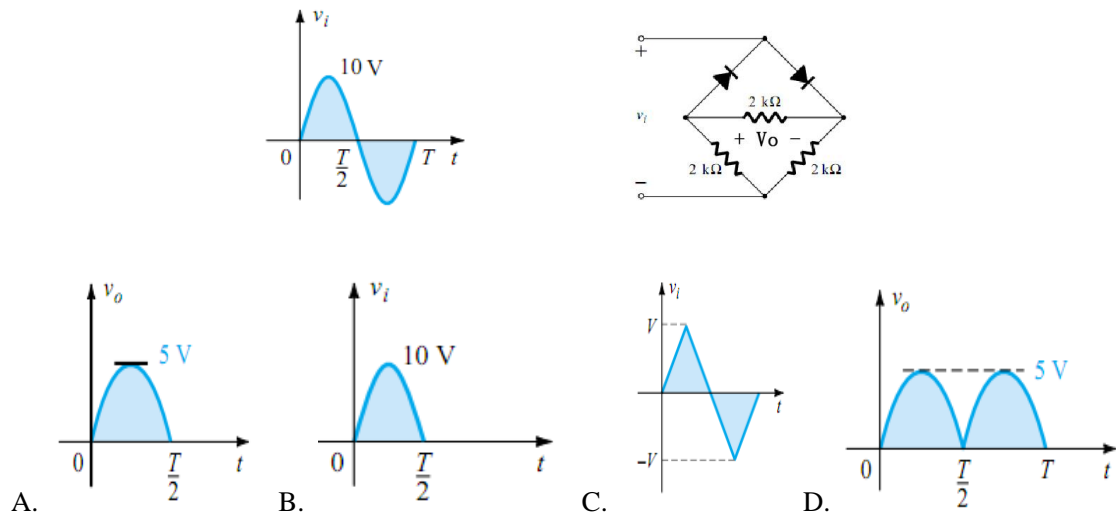
A. n-channel depletion-type MOSFET

B.p-channel enhancement-type MOSFET

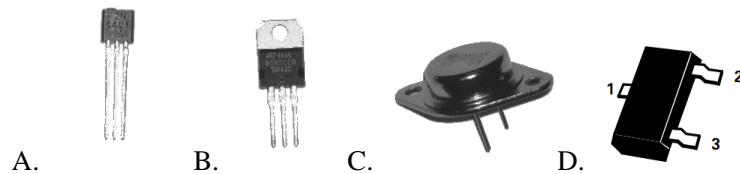
C. n-channel enhancement-type MOSFET

D.n-channel MESFET

7. Determine the output waveform for the network shown below



8. For the figures shown below , which package is used for high power ? ()



9. For the Comparator shown below, the LED will go on when $V_i =$ ____ . ()

A. +6.5V B. +5.5V C. +12V

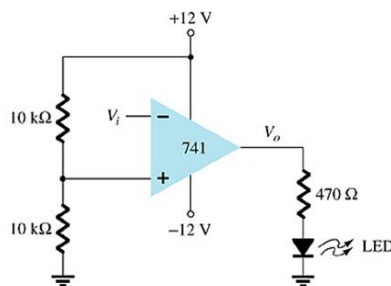
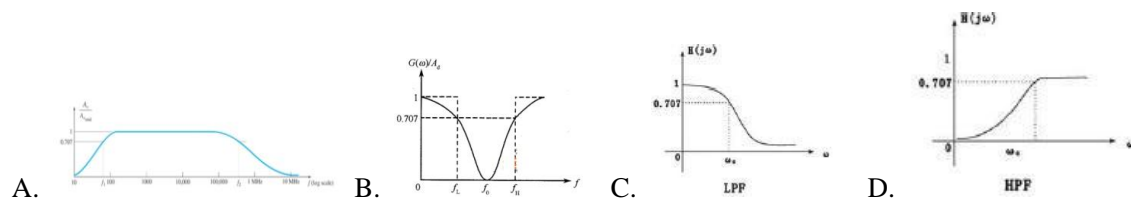
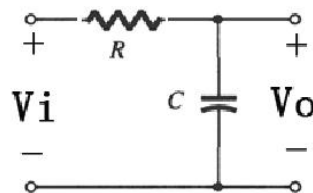


Fig.4

10. For the circuit shown below , please determine the bode plot of frequency response: ()



ii. **fill in the blanks (15%)**

- Operational amplifier or op-amp, is a very ____ (high or low) gain differential amplifier with a ____ (high or low) input impedance and ____ (high or low) output impedance. Operational amplifier can amplify the ____ (differential or common) signal while reject the ____ (differential or common) signal at the two inputs. In order to control the gain of an op-amp it must have ____.
- For the circuit shown in Fig.5, if $V_A = 10V$, $V_B = 0V$, $V_{CE} = 0V$, $V_{out} =$ ____ V. (2 point)

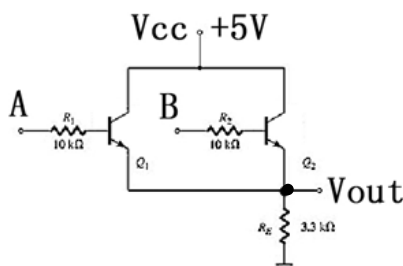


Fig.5

- A popular application use ____ to build active filter circuits, which uses ____ (positive or negative) feedback. The great advantage of active filter circuit, compared with passive filtering, is that voltage gain and cut-off frequency ____ (will or won't) change with the load
- There are four basic ways of connecting the feedback signal in Fig 6.
 - voltage-series feedback
 - voltage-shunt feedback
 - current-series feedback
 - current-shunt feedback

- (a) is ____ (b) is ____
 (c) is ____ (d) is ____ (please filled with A,B,C,D)

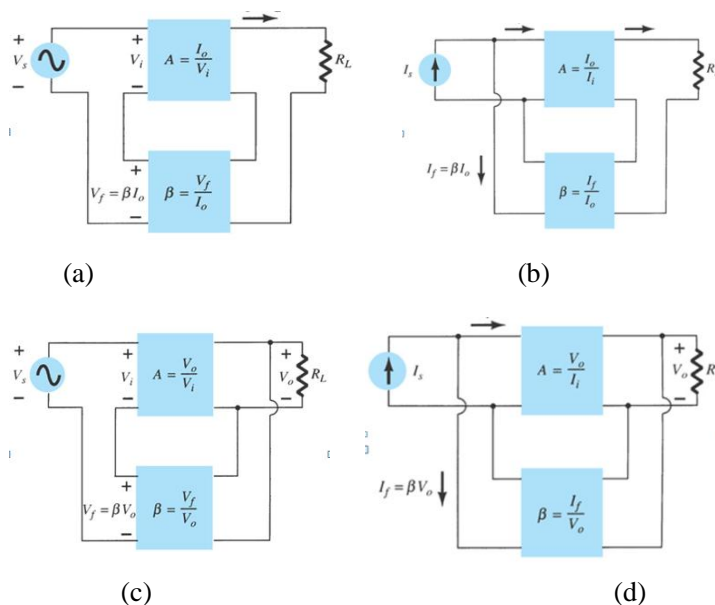
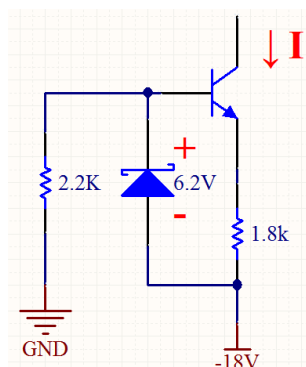


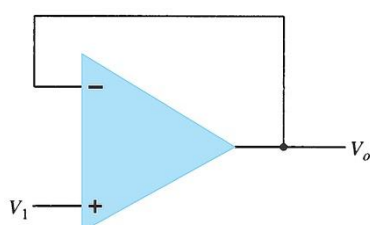
Fig.6

iii. essay questions (65%)

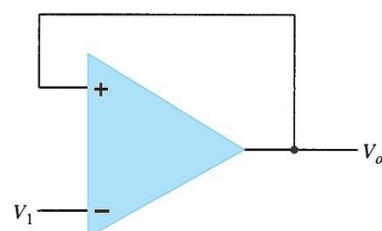
1. Calculate the constant current I in the circuit shown below, $V_{BE} = 0.7\text{ V}$ (5%)



2. (a) Which circuit is unity follower? Please give the reasons. (5%) [tips: use the feedback theory to explain]

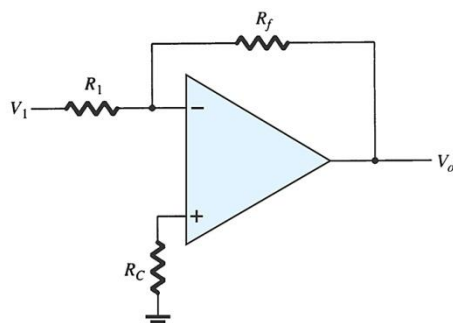


A

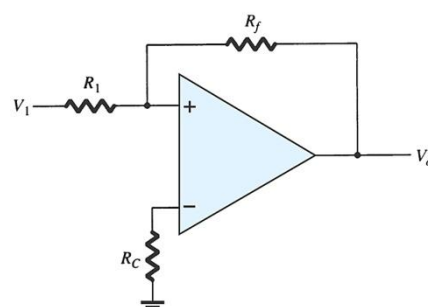


B

- (b) Which circuit is inverting amplifier? Please give the reasons and provide the relational expression of V_1 and V_o . (5%)



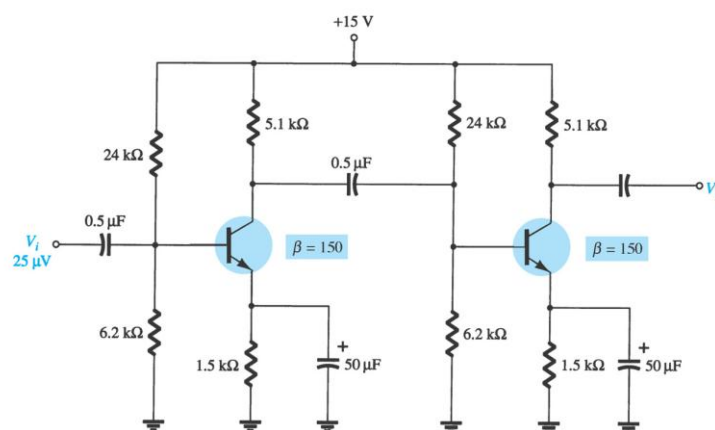
A



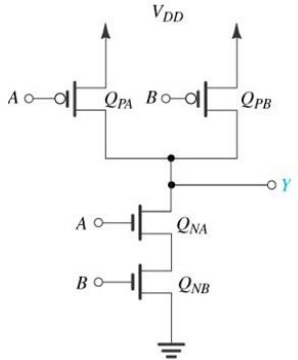
B

3. (15%) A BJT cascade amplifier is shown below. Assuming $V_{BE(on)}$ is 0.7 V ,

- (1) Calculate the dc bias voltages and collector current
- (2) Calculate the voltage gain of each stage
- (3) Calculate the overall ac voltage gain without loading and with $1\text{-k}\Omega$ loading resistance

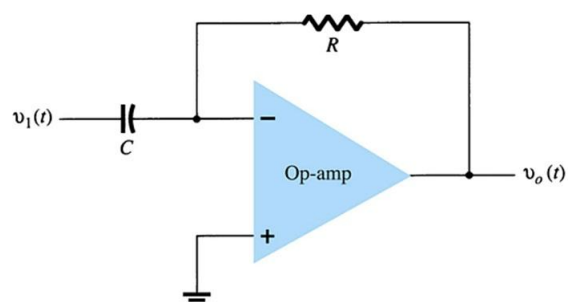


4. Fill in the blank areas (10%)

Logic circuit	Truth table	Function															
	<p>4%</p> <table border="1"> <thead> <tr> <th>A</th><th>B</th><th>Y</th></tr> </thead> <tbody> <tr> <td>0</td><td>0</td><td></td></tr> <tr> <td>0</td><td>1</td><td></td></tr> <tr> <td>1</td><td>0</td><td></td></tr> <tr> <td>1</td><td>1</td><td></td></tr> </tbody> </table>	A	B	Y	0	0		0	1		1	0		1	1		<p>1%</p>
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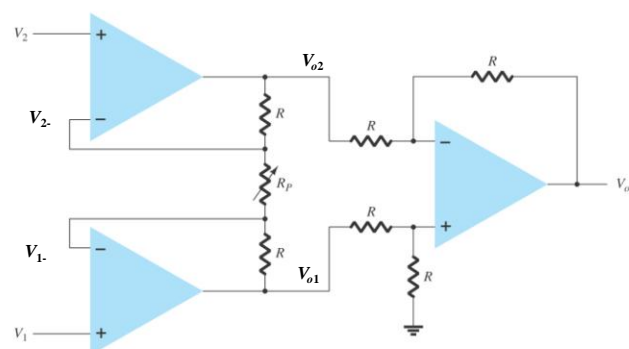
5. Op-Amp application circuits (20%)

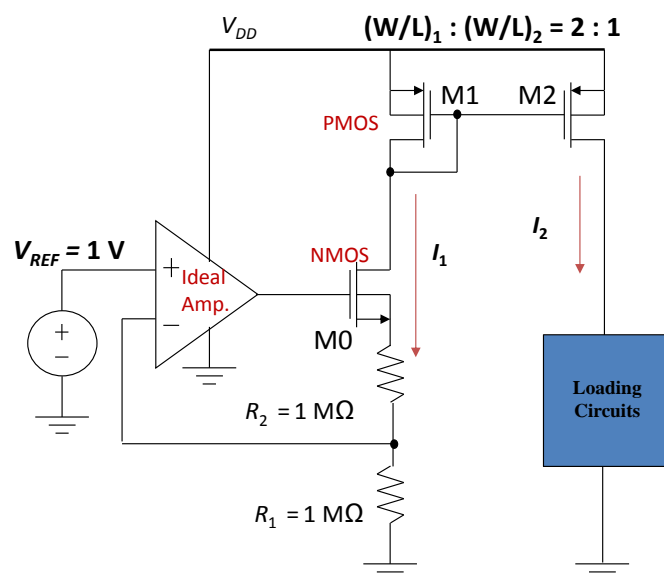
(1) Find the relationship between V_1 and V_o (5%)



(2) For the instrumentation amplifier circuit shown below, $R = 500 \Omega$, $R_p = 5 \text{ k}\Omega$, and all operational amplifiers are ideal. (15%)

- Find the relationship between V_1, V_2 and V_{o2}
- Find the relationship between V_1, V_2 and V_{o1}
- Find the relationship between V_{o1}, V_{o2} and V_o
- Find the value of V_o if $V_2 = 5 \text{ V}$ and $V_1 = 10 \text{ V}$





The End