國立臺灣科技大學
八十九學年度碩士班招生考試試題
系所組別： 電子工程系乙一組、電子工程系乙二組、電子工程系乙三組
科　目： 電子電路學

(總分共 100 分)

注意: 1-4 題均屬於填充題, 每空格為五分,請在分析後,保留推導結果, 依子題順序將答案填寫在答案卷上；單位必需填寫否則不予計分。

1. A bridged-T network is placed in the negative-feedback path of an infinite-gain op amp as shown in Fig. P1. Please analyze this circuit and then write down the results of the following problems in order on the answer sheet. (25%)

(注意: 請分析後,保留推導結果並依序寫下答案,且必需有單位,否則不予計分)

(1) Find the transfer function
$T(s)=V_o(s)/V_i(s)=$_____

(2) What kind of the filter in this amplifier?
That is _____

(3) Find its ω_o,
$\omega_o =$_____

(4) Find its Q,
Q =_____

(5) Find the center-frequency gain of this amplifier
$|T(j\omega_o)| =$_____

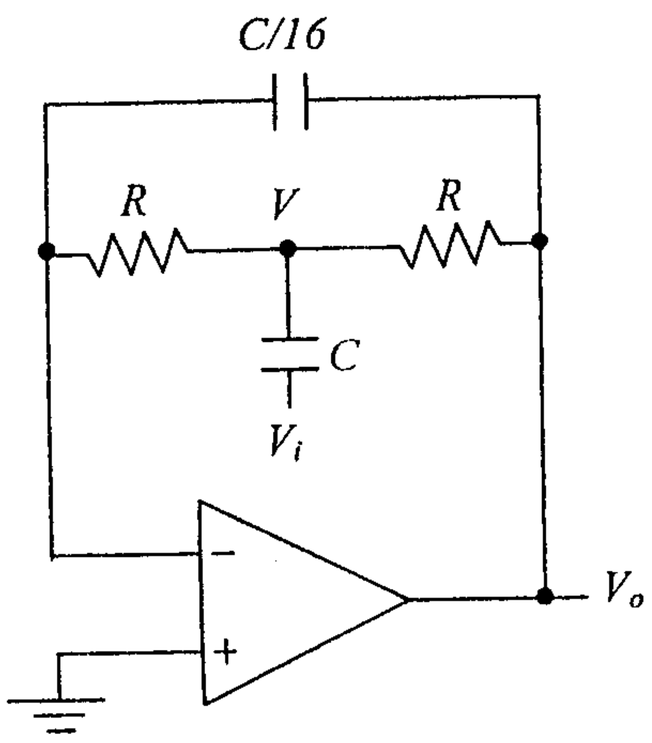

Fig. P1

2. An FET amplifier is shown in Fig. P2 is biased to operate at I_D=1mA and g_m=1mA/V. Neglecting r_o, answer the following problems. Please analyze this circuit and then write down the results of the following problems in order on the answer sheet. (25%)

(注意: 請分析後,保留推導結果並依序寫下答案,且必需有單位,否則不予計分)

(6) Find the midband gain
$A_M=$_____

(7) Find the value of C_S that places the corresponding pole at 10Hz

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C_S=_____

(8) What is the frequency of the transfer-function zero introduced by C_S?

f_z=_____

(9) Find the transfer function

$V_o(s)/V_i(s)$=_____

(10) Find the dc gain of this amplifier

$G_{dc}= V_o(0)/V_i(0)$=_____

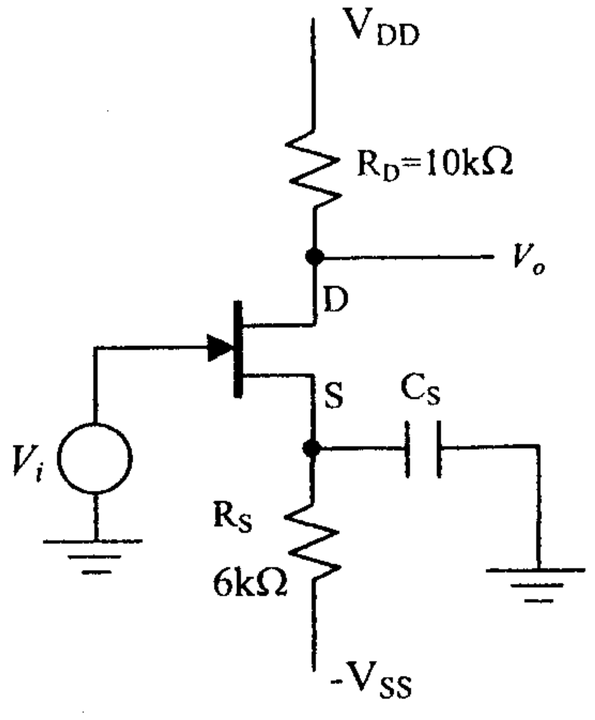

Fig. P2

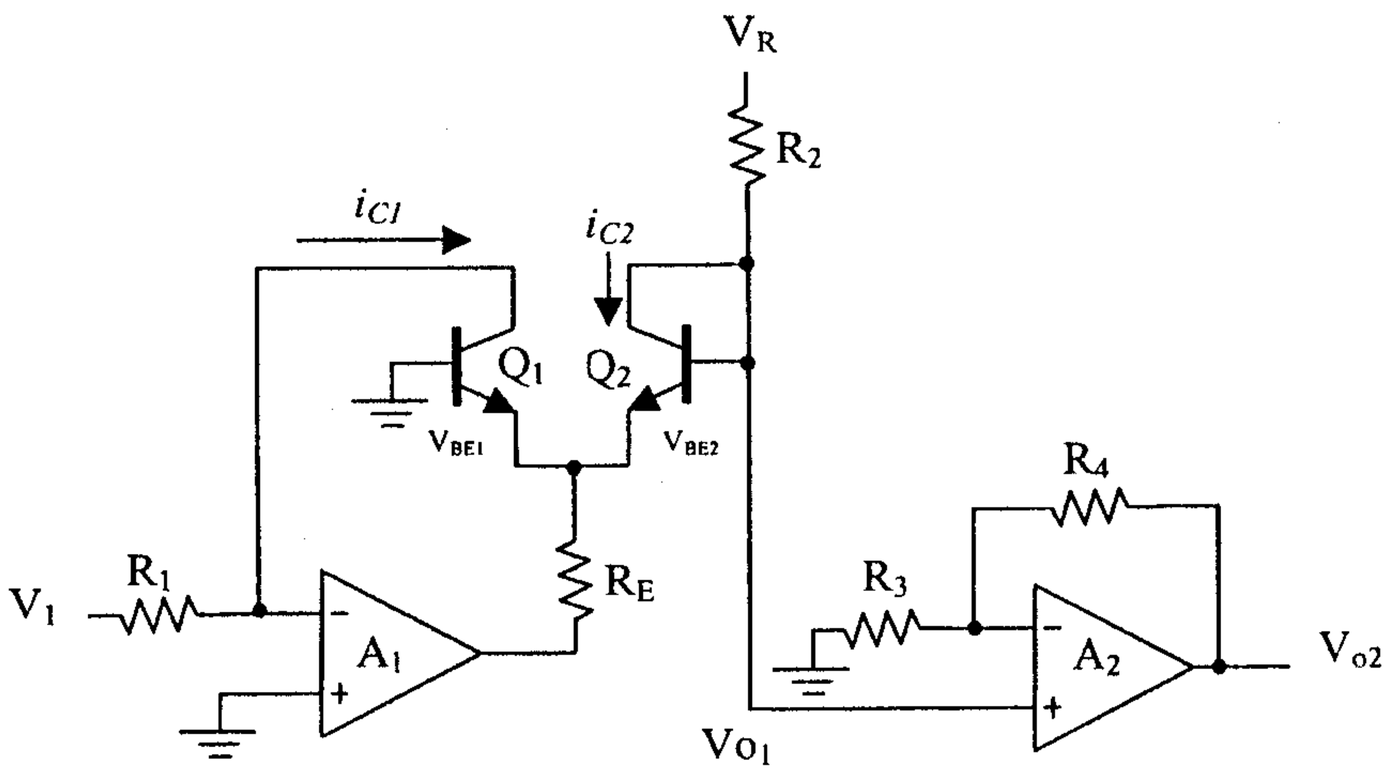

Fig. P3

3. A Log amplifier to be implemented by two op-amps and two transistors is shown in Fig. P3, in which all devices are identical. Some parameters including a reference voltage V_R, thermal voltage V_T, and reverse saturation current I_S are considered. If the input voltage is V_I, please analyze this circuit and then write down the results of the following problems in order on the answer sheet. (25%)

(注意: 請分析後,保留推導結果並依序寫下答案,且必需有單位,否則不予計分)

(11) Find the current i_{C2} in terms of the specified parameters

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i_{C2}=_____

(12) Find the voltage V_o in terms of the specified parameters

V_{o1}=_____

(13) Find the voltage V_{o2} in terms of the specified parameters

V_{o2}=_____

(14) Let R_1=R_2=R_3= 10kΩ, R_4=375kΩ, and V_R=10V. If T=300K, determine the output voltage V_{o2} for V_I=0.02V and 2.0V.

V_{o2} =_____ for V_I=0.02V,

V_{o2} = _____ for V_I=2.0V.

4. A Class A power amplifier is shown in Fig. P4a, in which the transistor have the specifications, i.e., $P_{C,max}$=10W (after derating), BV_{CEO}=60V, and $i_{C,max}$=3A. In this problem, R_E=1Ω, R_L=8Ω, the reactance's of all capacitors are neglected, and the inductance is ∝. If the input signal is sinusoidal, please analyze this circuit and then write down the results of the following problems in order on the answer sheet.(25%)

(注意: 請分析後,保留推導結果並依序寫下答案,且必需有單位,否則不予計分)

(15) Find the optimal operating point of the transistor to achieve a maximum symmetrical swing (I_{CQ}, V_{CEQ})=(_____)

(16) Plot the $P_{C,max}$ curve on the output characteristic curve of i_C—v_{CE} shown in Fig. P4b and find the possible supply voltage V_{CC} in this circuit,

繪製 $P_{C,max}$ curve 在如 Fig. 4b 之 i_C-v_{CE} 座標上_____(此作圖爲五分)

V_{CC}=_____

(17) Find the maximum output power $P_{L,ac,max}$ for a sinusoidal input signal

$P_{L,ac,max}$ =_____

(18) Find the maximum power $P_{CC,max}$ drawn from the power supply and the maximum power efficiency η_{max} in this amplifier

$P_{CC,max}$=_____

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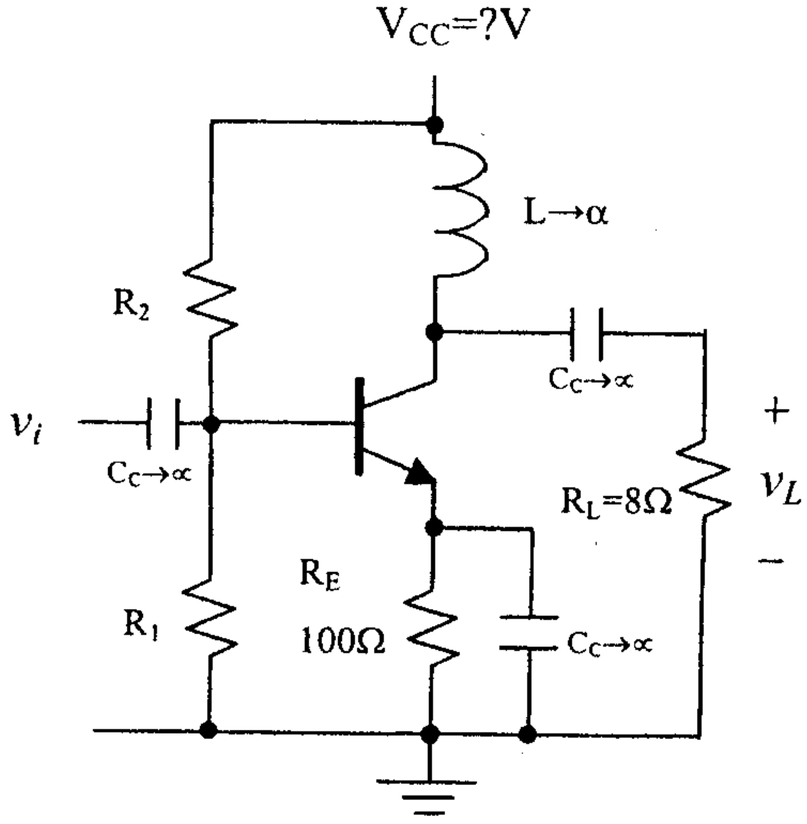

Fig. P4a

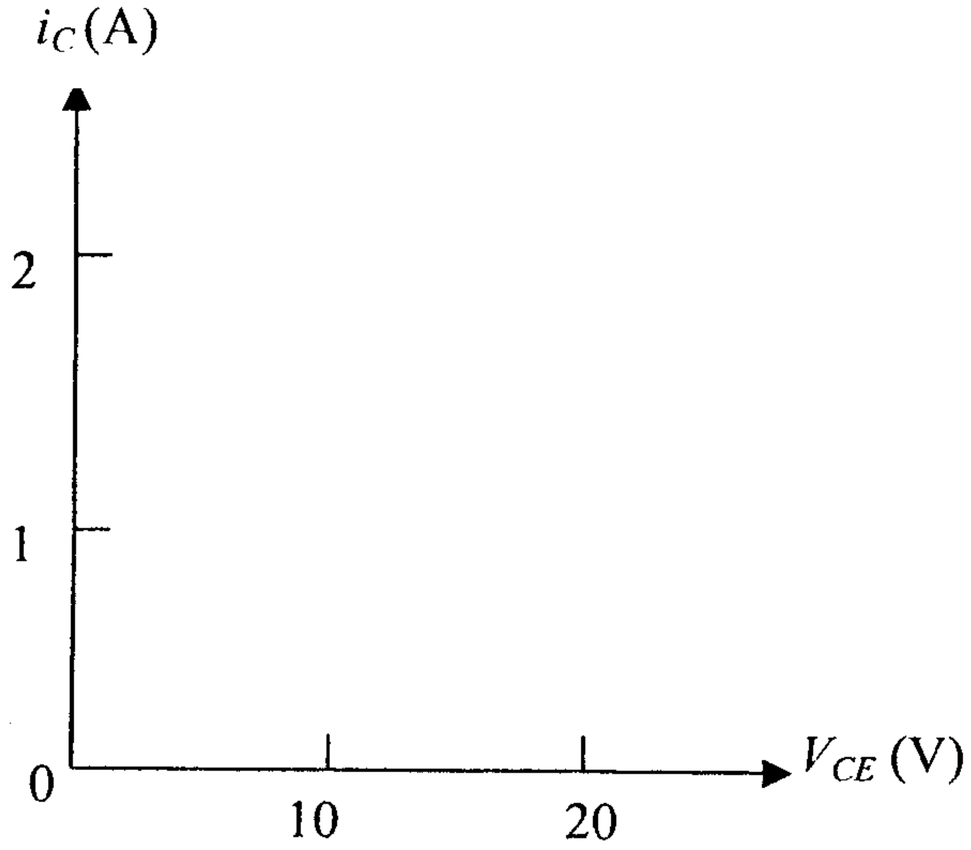

Fig. P4b