

國立臺北科技大學 103 學年度碩士班招生考試

系所組別：2230 電子工程系碩士班丙組

第三節 電子學 試題

第一頁，共一頁

注意事項：

1. 本試題共五題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. (a) What is Nyquist's criterion? (5%)
(b) Draw the locus on the Nyquist's plane for both a stable and an unstable system. (10%)
(c) Describe advantages of a negative feedback amplifier. (5%)
2. Assume M_1 is in saturation with a transconductance g_{m1} as shown in Fig. 1. Please calculate
(a) the input impedance (Z_{in}). (Consider the gate-to-source capacitance (C_{gs1}) and gate resistance (r_{g1})). (10%)
(b) the frequency that Z_{in} is purely imaginary. (5%)
(c) What is the application of this circuit? (5%)

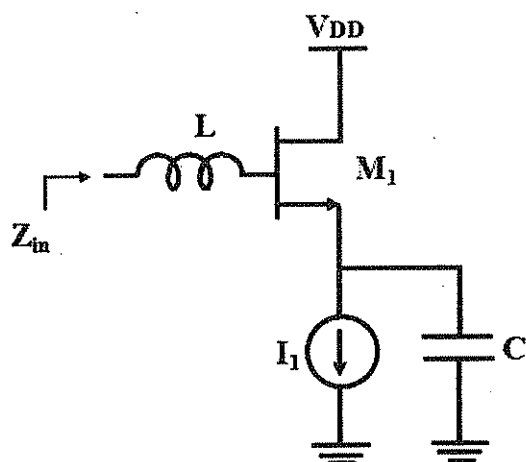


Fig. 1

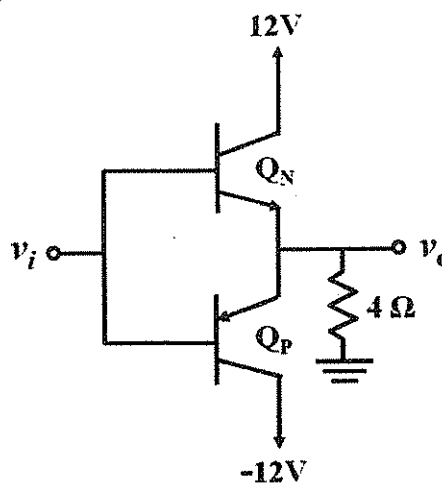


Fig. 2

3. Figure 2 shows a class-B power amplifier. If the output is a sinusoidal with 10-V peak amplitude, please find (a) the input power, (b) the average power drawn from each power supply, (c) the power efficiency at this output voltage, and (d) the maximum power that each transistor must be capable of dissipating safely. (5%×4=20%)

4. A transfer function is known as $T(s) = 10^4 \left(1 + \frac{s}{10^5}\right) \left(1 + \frac{s}{10^3}\right)^{-1} \left(1 + \frac{s}{10^4}\right)^{-1}$.

(a) Please sketch the Bode plot. (15%)

(b) Determine the $T(\omega=10^6 \text{ rad/sec.})$ from (a). (5%)

5. In the amplifier circuit as shown in Fig. 3, JFET parameters are: $I_{DSS}=10\text{mA}$, $V_p=-1\text{V}$, $\lambda=0$, $C_{gs}=C_{gd}=0.5\text{pF}$. Capacitors C_1 and C_2 are very large. The drain voltage should be biased at $V_D=5.1\text{V}$.

(a) Find the value of R_s . (5%)

(b) Find the g_m value and mid-band voltage gain V_o/V_i . (5%)

(c) Find the Miller's capacitance C_M . (5%)

(d) Find the upper 3-dB frequency f_H . (5%)

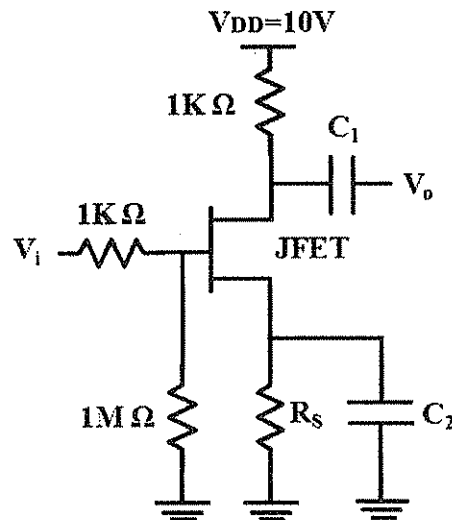


Fig. 3