國立中山大學107學年度碩士暨碩士專班招生考試試題

科目名稱：電子學【電波領域聯合】　　題號：482003

※本科目依簡章規定「可以」使用計算機（廠牌、功能不拘）　　

1. (30%) Figure 1 shows an amplifier made of a single MOSFET that is biased with I_D = 0.5 mA. Assume that all capacitors C_1, C_2 and C_3 are large enough to act like shorted in the frequency band of interest, and the parasitic capacitances of the MOSFET Q and the series gate resistance are negligible. The transistor Q has the device parameters: W/L = 80, $\mu_n C_{ox}$ = 50 μA/V^2, V_{TH} =0.7 V, λ = 0.1. **(a)(20%)** Draw the ac equivalent circuit. Determine the frequency (in rad/s) at which the amplifier achieves the peak gain, and determine this maximum gain. **(b) (10%)** Find the bandwidth of the amplifier (in rad/s). Note: $I_D = \frac{1}{2}\mu_n C_{ox}\frac{W}{L}(V_{GS}-V_{TH})^2(1+\lambda V_{DS})$ for Q in saturation.

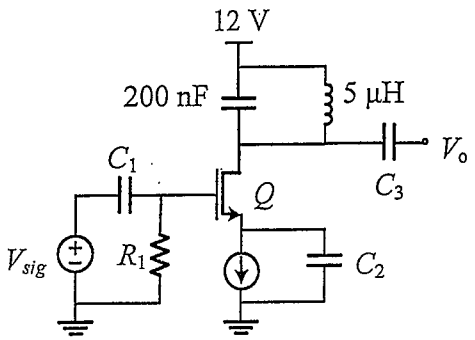

Fig. 1

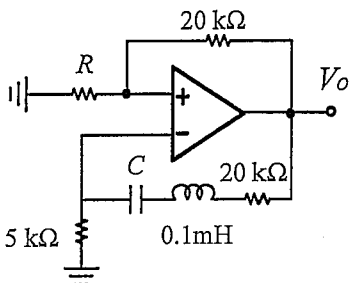

Fig. 2

2. (20%) Use the Barkhausen criterion to determine the values of R and C so that the Wien-bridge circuit in Fig. 2 oscillates at 100 kHz.

3. (30%) (a) (20%) Determine the values of R and C in Fig. 3 so that the average power dissipation on resistor R is maximized. **(b) (10%)** Calculate this maximum power.

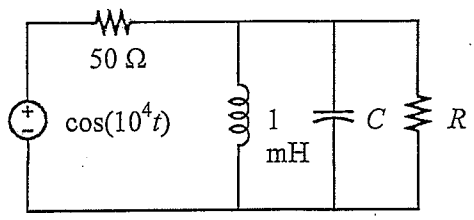

Fig. 3

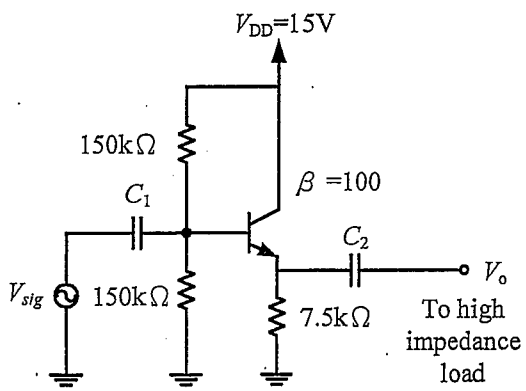

Fig. 4

4. (20%) An emitter follower in Fig. 4 is used to drive a very high impedance. C_1 forms a high-pass filter with the divider resistances and the resistance looking into the base. Choose the value of C_1 so that the resulting cutoff frequency is 1 kHz.

試題隨卷繳回