系級班別：_____ 學號：_____ 姓名：_____

(不可攜帶資料，可用計算機) 請在答案卷右上方畫上成績欄，謝謝。

(20%) 1. A tuned-amplifier is shown in Fig. p1.

(a) Please show its small-signal equivalent circuit including the FET output resistance r_O and output capacitance C_O. (8%)

(b) Derive the (i) voltage gain $\frac{V_O(s)}{V_i(s)}$, (ii) center frequency ω_0, (iii) 3-dB bandwidth B, and (iv) Q factor. (12%)

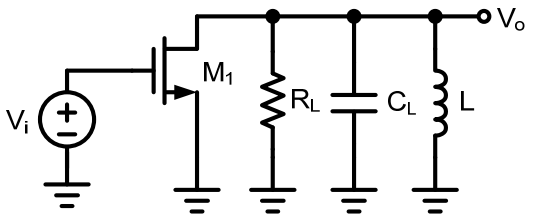

Fig. p1

(20%) 2. For Fig. p2(a) and Fig. p2(b), their maximum V_O is L_+ and minimum V_O is L_-.

(a) Draw their transfer characteristics of V_O vs. V_I. (10%)

(b) Calculate their negative and positive threshold voltages (V_{TL} and V_{TH}) of input triggers. (10%)

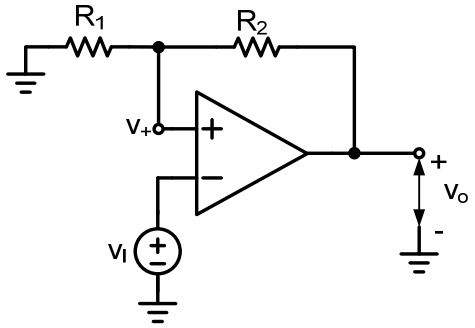

Fig. p2(a)

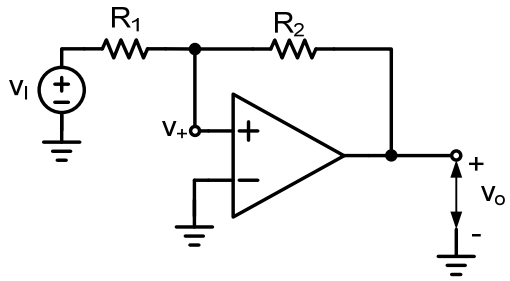

Fig. p2(b)

(20%) 3. For the circuit in Fig. p3, let the OPAMP saturation voltage be ±10V, R_1 = 100kΩ, R_2 = R = 1MΩ, and C = 0.01uF. Please draw the detailed waveforms of various nodes and derive the oscillation frequency of the circuit.

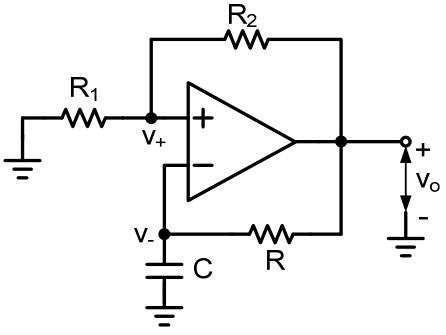

Fig. p3

(30%) 4. (a) Briefly explain total harmonic distortion. (3%)

(b) Briefly explain intermodulation distortion. (3%)

(c) Briefly explain a (i) class A, (ii) class B, and (iii) class AB amplifier. (12%)

(d) Demonstrate that even harmonics are eliminated in a balanced push-pull amplifier. (2%)

(e) Show that the maximum conversion efficiency of idealized class B push-pull circuit is 78.5 percent. (10%)

(20%) 5. For a class B output stage shown in Fig. p5,

(a) Explain its crossover distortion.

(b) Give an example for reducing its crossover distortion.

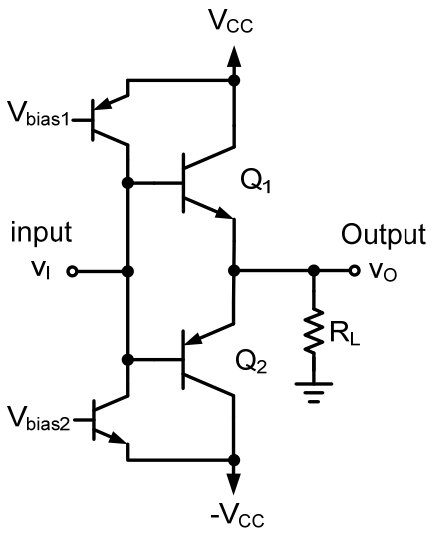

Fig. p5