國 立 宜 蘭 大 學

１０５學年度研究所碩士班考試入學

准考證號碼：

《作答注意事項》

1. 請先檢查准考證號碼、座位號碼及答案卷號碼是否相符。

2. 考試時間：100 分鐘。

3. 本試卷第 1 題為 8 個單選題:40 分，2~7 題為計算題:60 分，共計 100 分。

4. 請將答案寫在答案卷上。

5. 考試中禁止使用大哥大或其他通信設備。

6. 考試後，請將試題卷及答案卷一併繳交。

7. 本試卷採雙面影印，請勿漏答。

8. 本考科可使用非程式型（不具備儲存程式功能）之電子計算機。

1. Choose ONE correct answer for each of the following questions: (40%)

   (1) N-type faster than P-type transistors (under the same size) in operating speed is due to (A)carrier mobility (B)carrier concentration (C)electrical field (D)energy gap.

   (2) Assuming the reverse saturation current through the diode to be 3nA, what is the new reverse saturation current when the temperature is raised to 45°C? (A)6nA (B)8nA (C)10nA (D)12nA。

   (3) Which one of the following items is NOT one of ideal OPA characteristics? (A) Infinite input impedance (B)Infinite output impedance (C)Infinite bandwidth (D) Infinite voltage gain

   (4) Which one of the following items is NOT included in the body effect in MOSFET transistors? (A)Increasing threshold voltage (B)Reducing gate-to-source diffusion capacitor (C)Reducing transistor operating speed (D)None of the above

   (5) In Fig. 1, the period of the oscillator is (A)$1.4R_2C$ (B)$1.4(R_1C+ R_2C)$ (C) $0.7R_1C$ (D) $0.7(R_1C+ R_2C)$
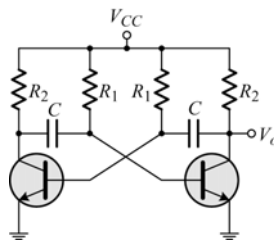

Fig. 1

   (6) The threshold voltage is a function of a number of parameters. Which one of the following items is NOT included? (A) Gate conductor material (B) Gate insulation material (C) Voltage between the source and the substrate (D) Drain current.

   (7) Diffusion capacitance in diodes is existed when *pn* junction is under (A)reverse bias (B) open circuit (C)forward bias (D)short circuit.

   (8) Which one of the following about the common base amplifier is NOT correct? (A)high voltage gain (B)good high frequency response (C)high input resistance (D)high out resistance

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2. Assuming the op amp to be ideal, calculate the output voltage v_{o2} in terms of the input voltage v_{I2} shown in Fig. 2. (10%)
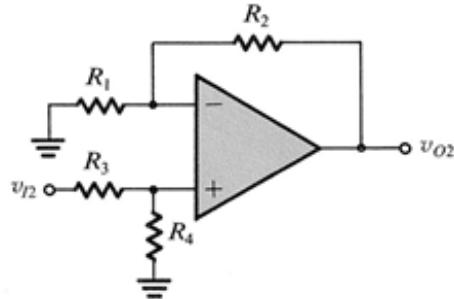
Fig. 2

3. Assuming the diodes to be ideal, find the transfer characteristic of the circuit shown in Fig. 3. (10%)
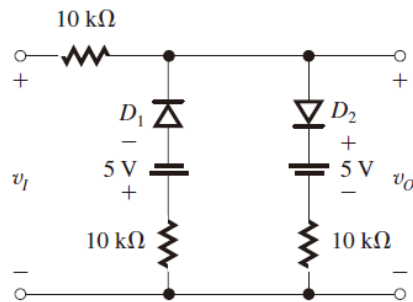
Fig. 3

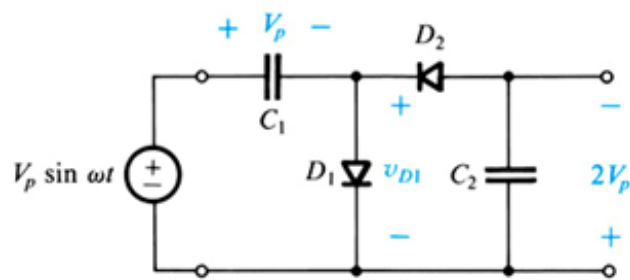4. Describe the voltage doubler shown in Fig. 4, and sketch its output waveform. (10%)

Fig. 4

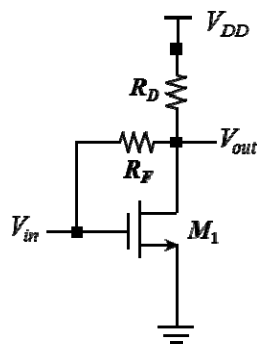5. Calculate the voltage gain of the circuit shown in Fig. 5. (10%)

Fig. 5

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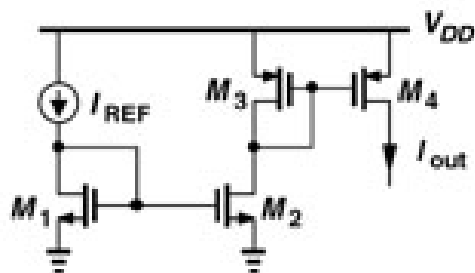6. Find the drain current of M_4 in Fig. 6 if all of the transistors are in saturation. (10%)

Fig. 6

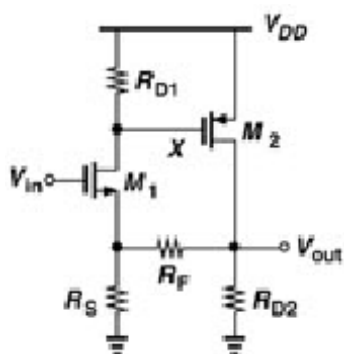7. Neglecting λ and γ, calculate the open-loop and closed-loop gains shown in Fig. 7. (10%)

Fig. 7