

國立宜蘭大學

106 學年度研究所碩士班考試入學

電子學(範圍相當於 Sedra/Smith 微電子學前七章)試題

(電子工程學系碩士班)

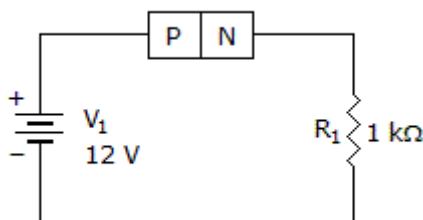
准考證號碼：

《作答注意事項》

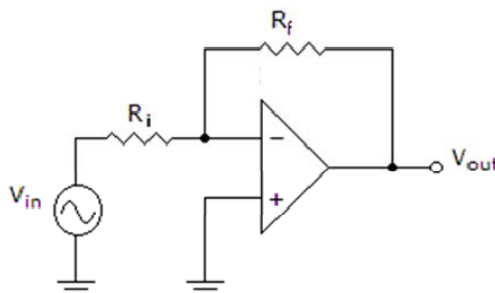
- 1.請先檢查准考證號碼、座位號碼及答案卷號碼是否相符。
- 2.考試時間：100 分鐘。
- 3.本試卷第 1 題為 14 個單選題，每小題 5 分小計 70 分；第 2~4 為計算題，每題 10 分小計 30 分，共計 100 分。
- 4.請將答案寫在答案卷上。
- 5.考試中禁止使用手機或其他通信設備。
- 6.考試後，請將試題卷及答案卷一併繳交。
- 7.本試卷採雙面影印，請勿漏答。
- 8.本考科可使用非程式型（不具備儲存程式功能）之電子計算機。

1. Choose ONE correct answer for each of the following questions: (70%)

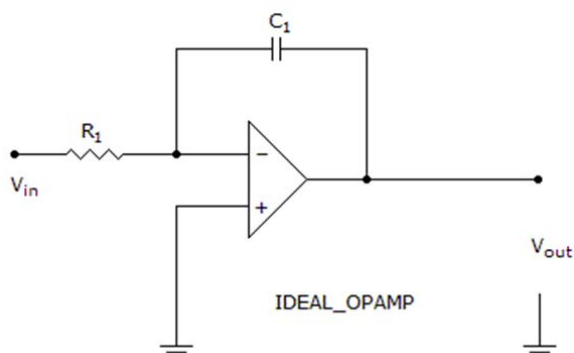
- (1) In "n" type material, majority carriers would be:
 (A) dopants (B) atoms (C) holes (D) electrons
- (2) What is the voltage across R_1 if the P-N junction is made of silicon?
 (A) 12 V (B) 11.7 V (C) 11.3 V (D) 0 V



- (3) An ideal operational amplifier has
 (A) infinite output impedance (B) zero input impedance (C) infinite bandwidth (D) All of the above
- (4) Decreasing the gain in the given circuit could be achieved by
 (A) reducing the amplitude of the input voltage (B) increasing the value of the feedback resistor (C) increasing the value of the input resistor (D) removing the feedback resistor

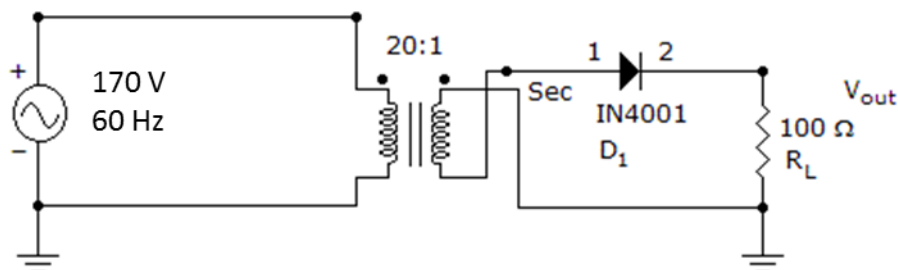


- (5) If the input waveform is square wave, what is the output waveform?
 (A) sine wave (B) square wave (C) pulse wave (D) triangle wave



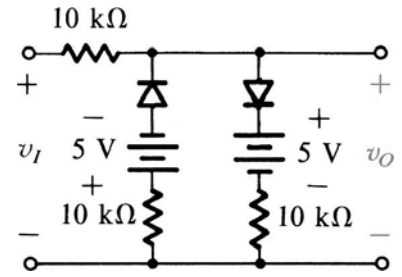
- (6) A pn diode has forward resistance of the order of
 (A) Ω (B) $k\Omega$ (C) $M\Omega$ (D) none of the above

- (7) A zener diode is used as
 (A) an amplifier (B) a voltage regulator (C) a rectifier (D) a multivibrator
- (8) What is the peak output voltage for this half-wave rectifier?
 (A) 1 V (B) 7.8 V (C) 10.9 V (D) 15.6 V

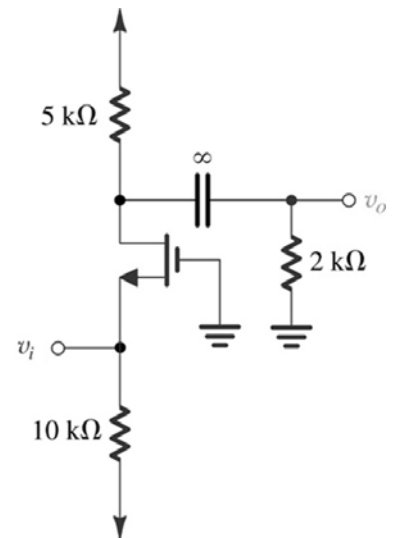


- (9) The phase difference between the input and output voltages of a transistor connected in common emitter arrangement is
 (A) 0° (B) 180° (C) 90° (D) 270°
- (10) According to the operating method, a transistor is
 (A) current operated (B) voltage operated (C) both voltage and current operated (D) none of the above
- (11) A common-collector is usually the last stage before the load; the main function of this stage is to
 (A) provide voltage gain (B) buffer the voltage amplifiers from the low-resistance load (C) provide phase inversion (D) provide a high-frequency path to improve the frequency response
- (12) In a JFET, I_{DSS} is known as
 (A) drain to source current (B) drain to source current with gate shorted (C) drain to source current with gate open (D) none of the above
- (13) A certain p-channel E-MOSFET has $V_{GS(th)} = -2V$. If $V_{GS} = 0V$, the drain current is
 (A) 0 mA (B) $I_{D(on)}$ (C) maximum (D) I_{DSS}
- (14) If a three-stage amplifier has individual stage gains of 10 dB, 5 dB and 12 dB, then total gain in dB is (A) 600 dB (B) 24.5 dB (C) 9 dB (D) 27 dB

2. Assuming the diodes to be ideal, find the output voltage v_o , if (a) $v_i = -2V$ and (b) $v_i = 7V$. (10%)



3. The NMOS transistor in the common-gate amplifier has $g_m = 5 \text{ mA/V}$ and a large r_o . Find the input resistance R_{in} and the voltage gain A_v . (10%)



4. Find the input resistance R_{in} and the voltage gain A_v of the amplifier assuming that $\beta = 100$. (10%)

