

國立成功大學

111學年度碩士班招生考試試題

編 號： 123

系 所： 工程科學系

科 目： 電子電路

日 期： 0220

節 次： 第 1 節

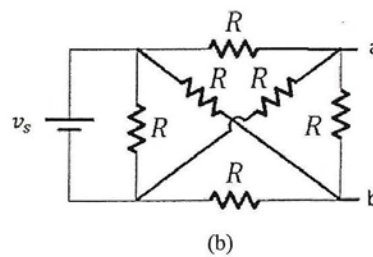
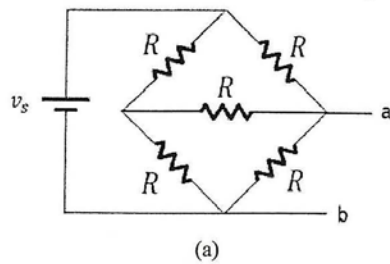
備 註： 可使用計算機

※ 考生請注意：本試題可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

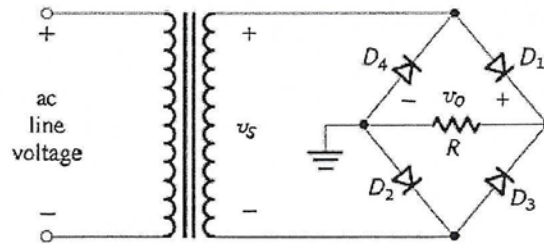
1. Mark each of the following statements True (T) or False (F). (Need NOT give reasons.) (20 pt.)

- (a) Generally, the frequency response of a circuit is a real number.
- (b) If only one op amp is utilized, both inverting and noninverting configurations of it must be used to derive a zero common-mode gain.
- (c) Inverting and noninverting input terminals of an op amp are virtually shorted under no circumstances.
- (d) The power used to amplify an AC signal is drawn from the input power.
- (e) Double cascading is useful for both MOS and BJT to obtain a high voltage gain.
- (f) The input sinusoidal signals of all frequencies are generally amplified by the op amp using the same gain.
- (g) For the voltage amplifier and current simplifier models, the open-circuit voltage gain A_{vo} of the voltage amplifier and short-circuit current gain A_{is} of the current simplifier are related by $A_{vo} = A_{is} \frac{R_o}{R_i}$, where R_o and R_i are output and input resistances of the amplifier.
- (h) The npn BJT injects holes into the Collector terminal to produce the Collector current.
- (i) The MOS transistor is used in saturation region for the signal amplification. Therefore, its cut-off and triode regions are useless and find no applications.
- (j) A common diode typically considers only forward and reverse biases because it is usually guaranteed not to enter the breakdown region.

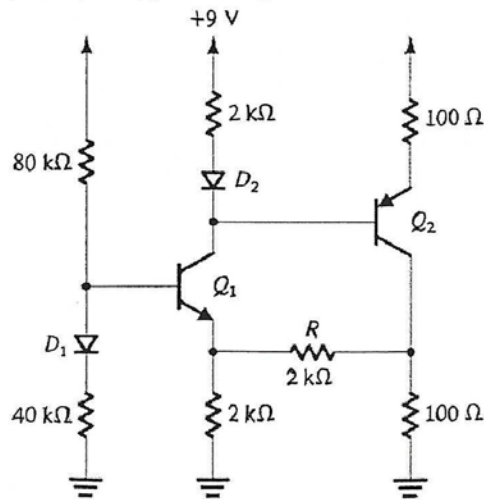
2. For the circuits below, find their Thévenin equivalent circuits between terminals a and b. (20 pt.)



3. The following figure shows a bridge rectifier. Assuming that $R = 100 \Omega$, v_s is a 12 V (rms) sinusoid, and the diodes use the constant voltage-drop model with a turn-on voltage of $V_D = 0.7$ V. Find the average (or dc component) of the output voltage v_o . (20 pt.)



4. Consider the following circuit, using $|V_{BE}| = 0.7$ V independent of current for all conducting BJTs. Also, the diode turn-on voltage is $V_D = 0.7$ V independent of current for all conducting diodes. Find V_{C2} of Q_2 for $\beta = 100$. Notice that, since $\beta \neq \infty$, you cannot ignore the base currents of transistors. (20 pt.)



5. Consider the following circuit, the body effect and channel-length modulation of MOSFETs are neglected. We have known that $g_{m1} = 1 \text{ mA/V}$, $g_{m2} = 20 \text{ mA/V}$, $R_S = 200 \text{ k}\Omega$, and $R_D = 10 \text{ k}\Omega$. Please find the output resistance R_{out} . (20 pt.)

