明新科技大學 105 學年度研究所考試入學招生 試題卷

系所類別	科目	節次	准考證號碼 (考生請填入)	考試 日期
電機工程系碩士班（電機組）	電子學	第一節		105/4/24

※答案須寫在答案卷內，否則不予計分。

1. In Fig. 1, assume that the diode with constant forward voltage drop 0.7V. The circuit parameters are V_{DD}=10V and R=100Ω. The dissipated powers of diode and resistor are P_D and P_R respectively. Calculate P_D and P_R. (Should you check the circuit carefully!)(10%)

2. In Fig.2, each of the diodes can be modeled as a constant voltage drop V_D=0.7V in the forward biased region. If R=10Ω, calculate the current I_D and the dissipated powers of R, D1, and D2 respectively. (10%)

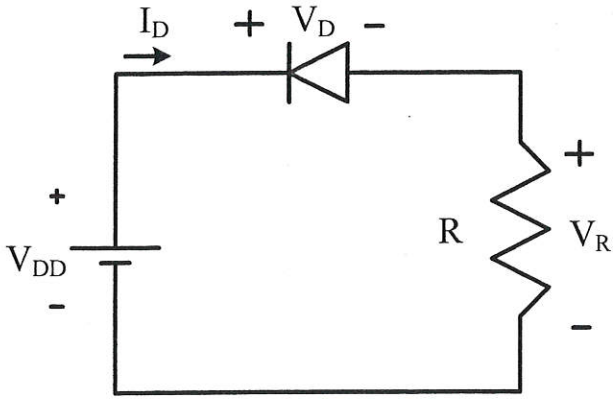

Fig. 1

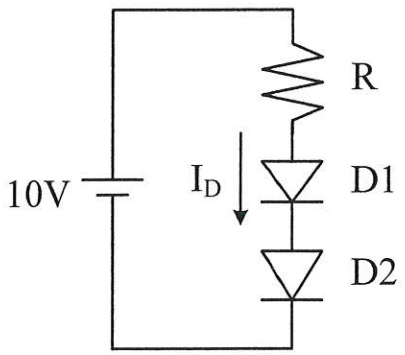

Fig. 2

3. As reference to Fig. 3, assume that the op-amp is ideal. Derive the relationship between v_o and v_1, v_2, v_3. (10%)
4. The op-amp circuit shown in Fig. 4 is a bi-stable circuit. The op-amp has output saturation voltages ±12V.
   (A) Derive and plot the transfer characteristics between v_o and v_I. (5%)
   (B) For R1=10kΩ, find the value of R2 to obtain threshold voltages of ±5V in this circuit. (5%)

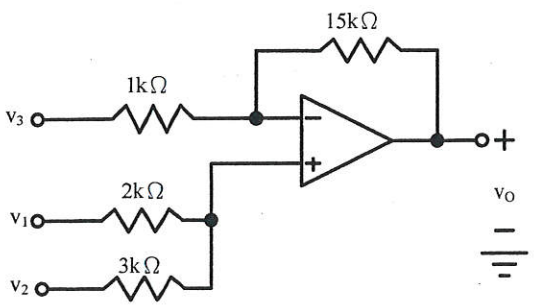

Fig. 3

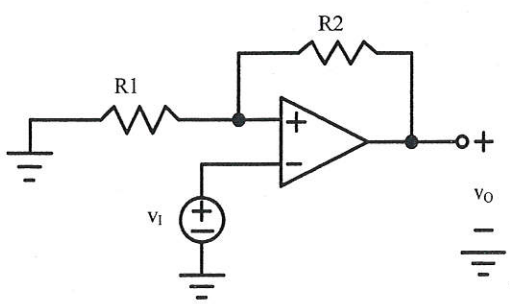

Fig. 4

5. For the circuit shown in Fig.5 is a RC single time constant circuit.
   (A) Derive the transfer function $T(S)=V_O(S)/V_I(S)$. (5%)
   (B) If R=10kΩ and C=10uF, determine the bandwidth of this circuit. (5%)
6. For the circuit shown in Fig. 6, if R1=1kΩ, R2=10kΩ, and C2=4nF, derive an expression for the transfer function $T(S)=V_O(S)/V_I(S)$ and find its DC gain and the -3dB frequency in Hz. (15%)

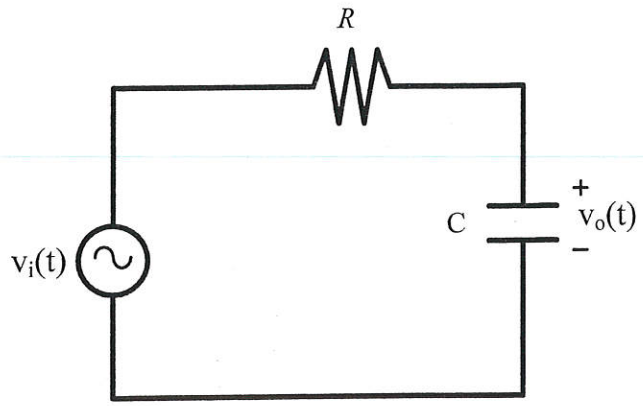

Fig. 5

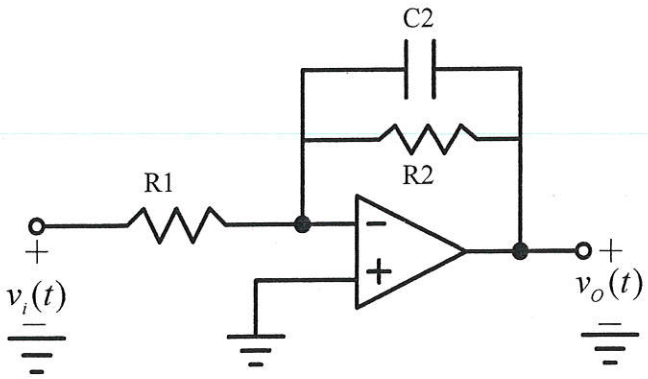

Fig. 6

7. Fig. 7 is a single stage N-MOSFET amplifier circuit. The N-MOSFET parameters are V_t=1.0V, $(\mu_n C_{ox})(W/L)$=2mA/ V^2, V_A=100V.
   (a) Determine its DC operating points of V_{GS},V_G, I_D, V_D, and small signal parameters of g_m and r_o. (15%)
   (b) Determine the small signal voltage gain of $A_v=(v_O/v_{sig})$. (10%)
8. Assume that the NPN transistor in Fig. 8 has β=100 and V_{BE}=0.7V, calculate I_B, I_C, I_E, V_C and V_E. (10%)

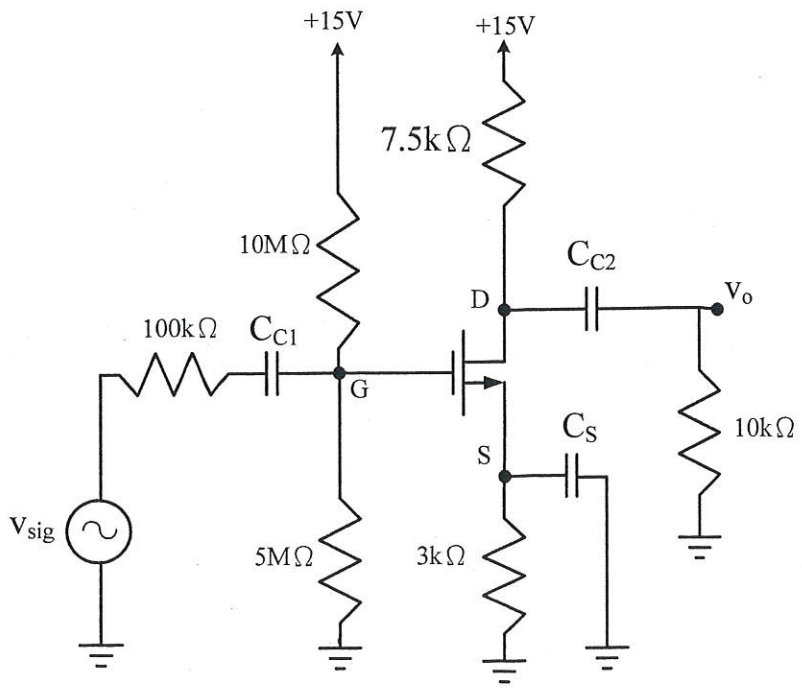

Fig. 7

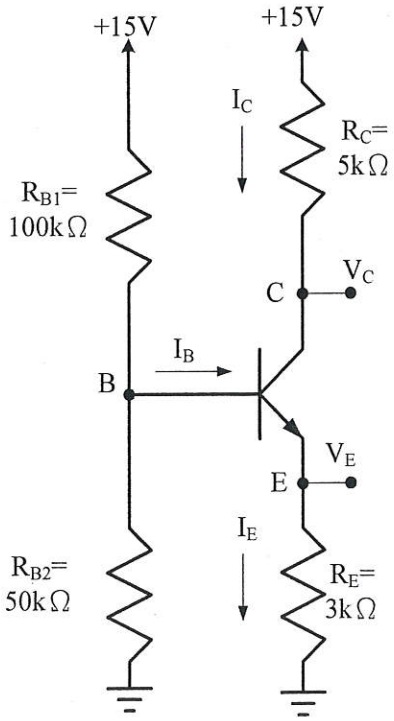

Fig. 8