國立成功大學 工程科學系 試題

電子學 (總分 110 分) 學號 E94063 姓名 張凱淳 5/20/2016

計算題 6 題(110 分，共三頁)。推導過程須要詳細寫出來，若觀念正確，才能斟酌給分。

1. Assuming that the diodes in the circuits of Fig.1, are ideal, find the value of labeled voltages and currents.(20%)

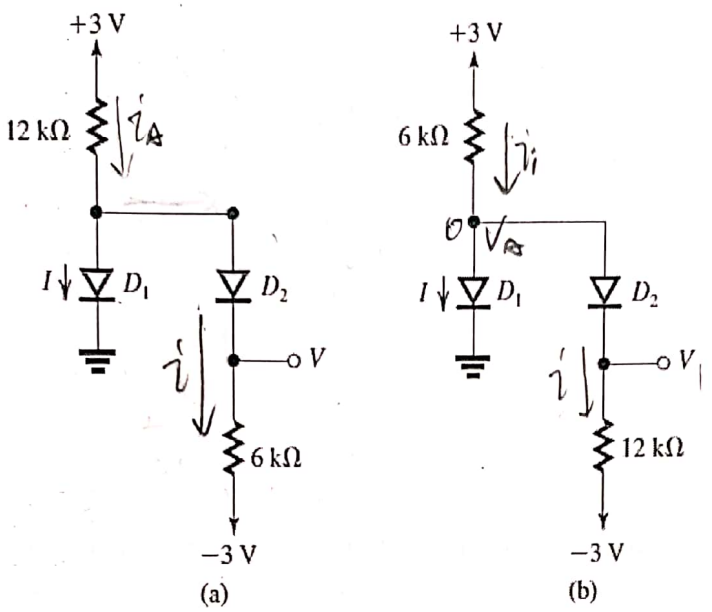

Fig.1

2. For the circuits shown in Fig.2, using the constant-voltage-drop ($V_D = 0.7V$) diode model, find the voltages and currents indicated.(20%)

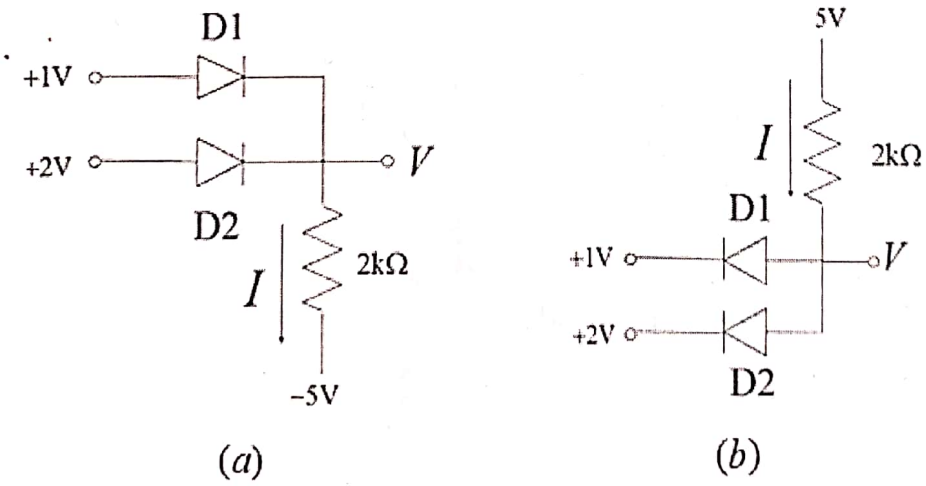

Fig.2

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3. The 6.8 V zener diode in the circuit of Fig.3 is specified to have V_Z =6.8 V at $I_Z = 5mA$, $r_Z = 20\Omega$, and $I_{ZK} = 0.2mA$. The supply voltage v_s is nominally 10 V but can vary by ±1 V.
   (a) Find the change in v_o resulting from connecting a load resistance $R_L = 2k\Omega$.(10%)
   (b) What is minimum values of R_L for which the diode still operates in the breakdown region?(10%)

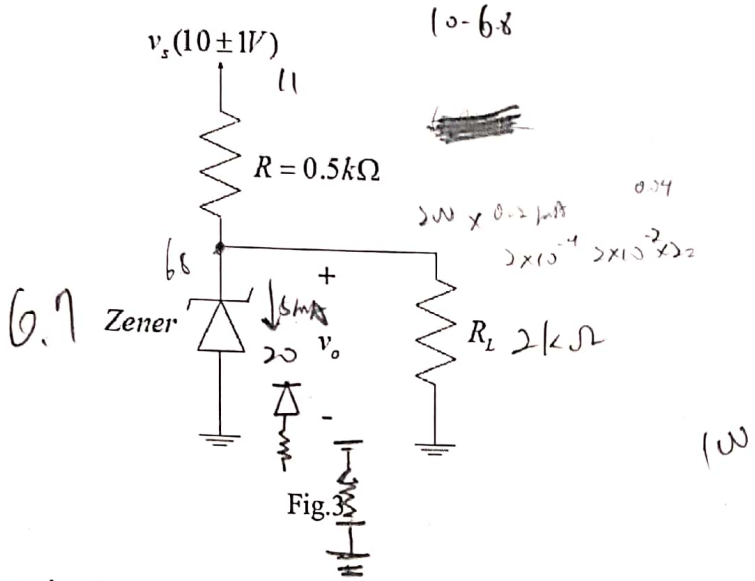

Fig.3

4. The NMOS transistor in the circuit of Fig.4 has $V_t = 0.4V$ and $k'_n(W/L) = 4mA/V^2$. The voltages at the source and the drain are measured and found to be −0.6V and 0.2V, respectively. What current I_D is flowing, and what must the values of R_D and R_S be? If we assume R_S is fixed, and NMOS operates in saturation region. What is the largest value for R_D for which I_D remain unchanged from the value found? Assume λ =0.(20%)

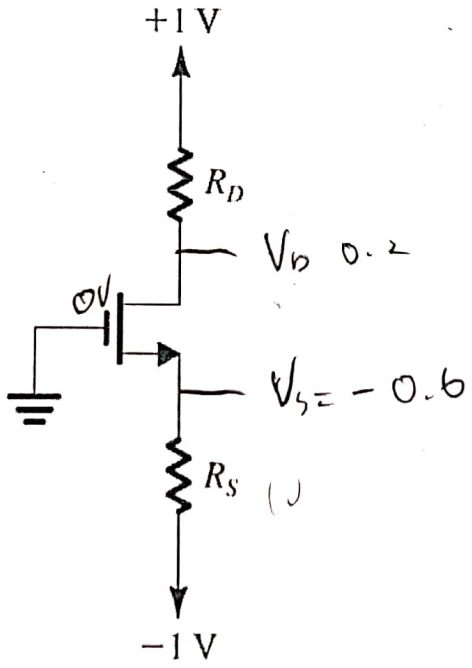

Fig.4

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5. In the circuit shown in Fig.5, transistors are characterized by $V_{tp} = -1V$, $k'_n(W/L) = 4mA/V^2$, find V_1 and V_2. , Assume λ=0. (20%)

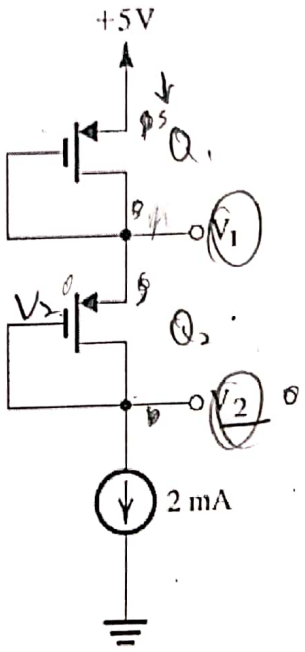

Fig.5

6. For each of the circuits shown in Fig.6, find the labeled nodes voltages. The NMOS transistors have $k'_n(W/L) = 1.5mA/V^2$ and $V_t = 0.9V$, Assume λ=0. (10%)

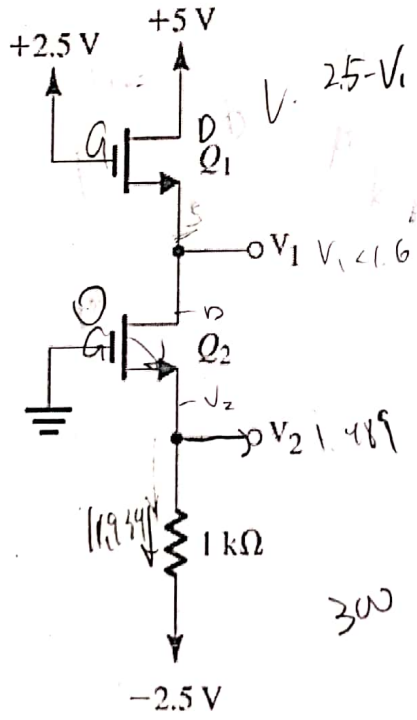

Fig.6

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