

八十八學年度 工科系 系(所) 丁 組碩士班研究生招生考試

科目 電子學

科號 3502 共 3 頁第 1 頁 \*請在試卷【答案卷】內作

(請注意!! 答題務必按題號順序)

1. Briefly answer the following questions.

- (a) Why does the drift current  $I_{\text{drift}}$  exist in the PN junction (diode)? Is the  $I_{\text{drift}}$  increased or decreased or not changed for the forward and reverse bias, respectively? (10%)
- (b) Sketch the cascade and cascode circuits, and then explain the advantages of these circuits, respectively. (10%)

2. For the rectifier circuit in Fig.2,  $V_{D(\text{on})} = 0.7\text{V}$ . If the  $V_o = 7 \pm 0.5\text{V}$ , sketch the waveforms of  $V_o$  and  $V_s$ , then find the value of peak inverse voltage (PIV) for the diode. (9%)

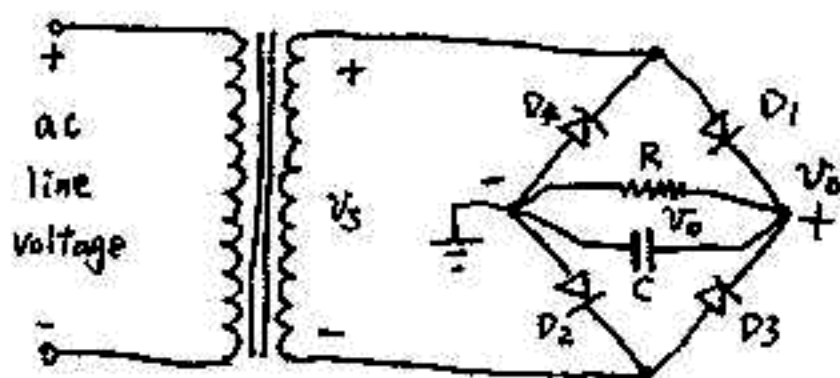


Fig. 2

3. For the n-channel metal-oxide-semiconductor field effect transistor (nMOS) amplifier with load of (a) enhancement MOS, (b) depletion MOS, (c) pMOS, sketch the  $i_D$  versus  $v_D$  with load curve, respectively. Briefly compare the major differences and advantages/disadvantages for these three load types. (9%)

4. For the simple operational amplifier in Fig.4, all the BJTs have  $\beta \gg 1$ ,  $|V_{BE}| = 0.7V$ , and no Early effect. Q6 has four times the area of each of Q9 and Q3. Find (a) the dc voltage of  $V_o$ , (b) the common-mode range of this op amplifier. (8%) (c) For the BJT and MOSFET op amplifier, compare the magnitudes of transconductance ( $g_m$ ) and offset voltage ( $V_{os}$ ). (4%)

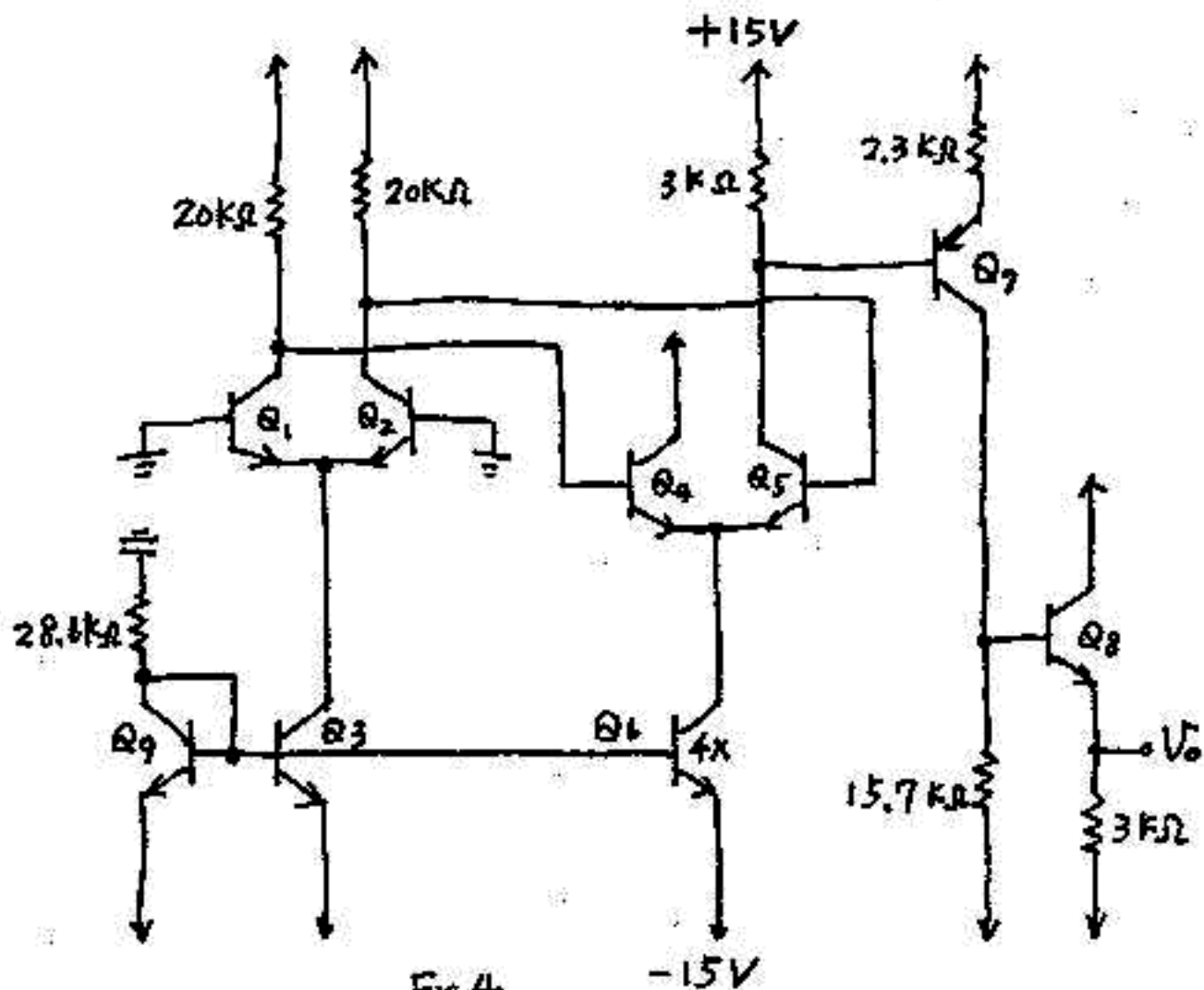
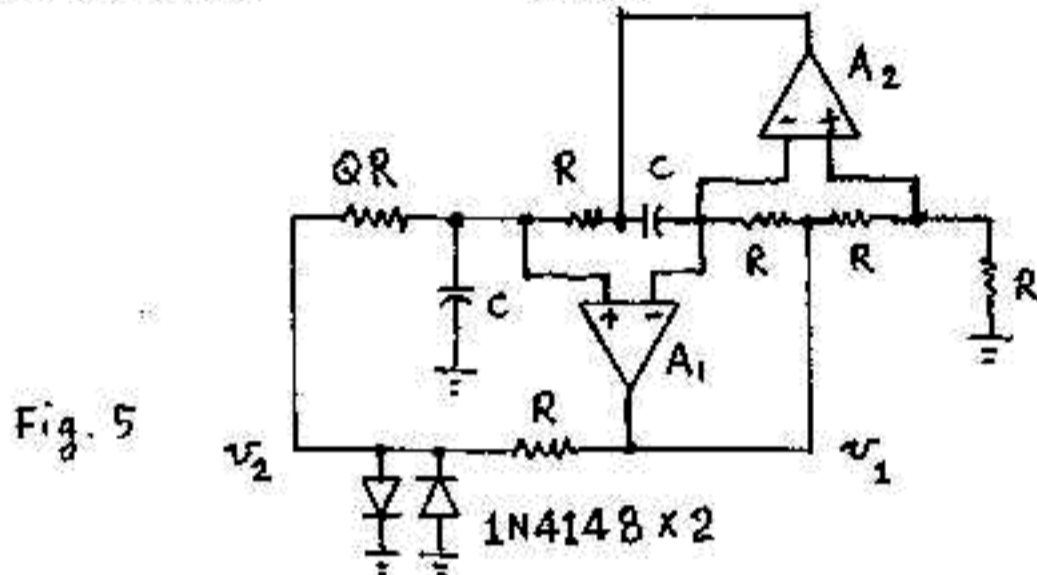
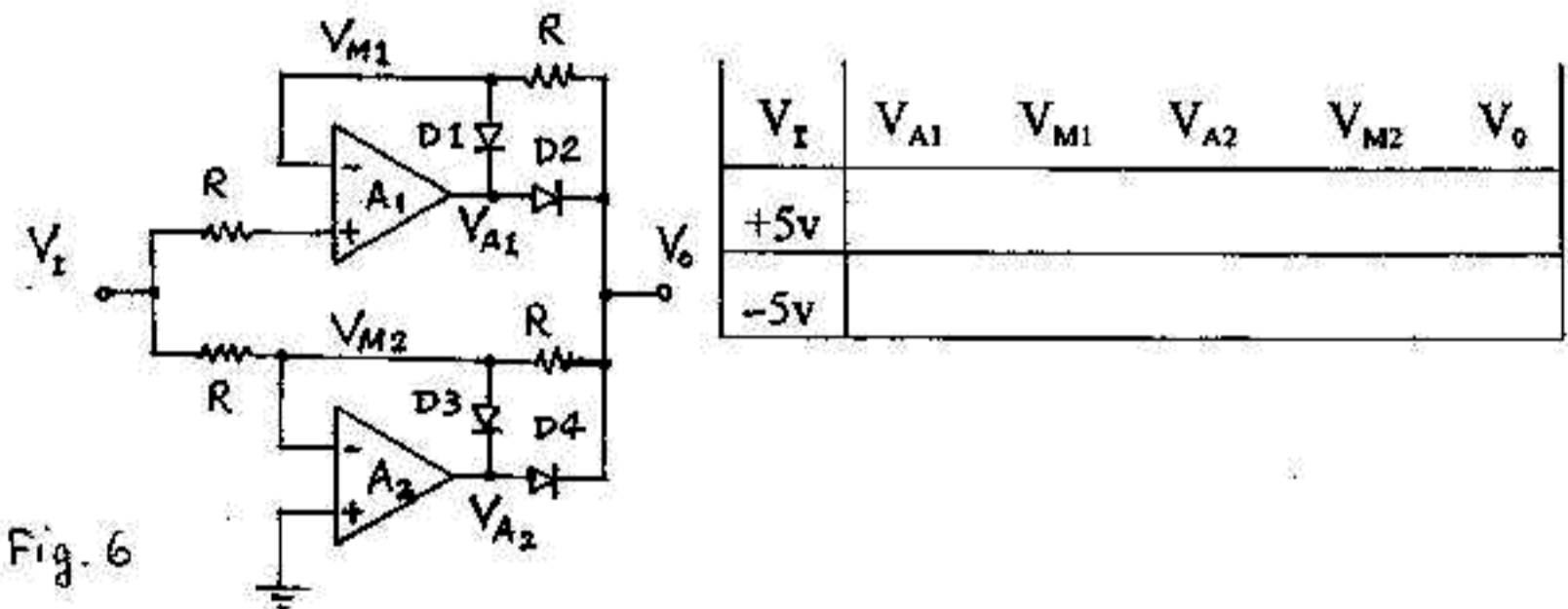


Fig. 4

5. Sketch the waveforms at  $v_1$  and  $v_2$  of the active-filter tuned oscillator, find the frequency of oscillation and describe the function of QR. How to stabilize the amplitude of oscillation?  
 ( $A_1, A_2$  = Ideal op amps) (20%)



6. For the circuit in Fig. 6, find the corresponding voltages listed in table. ( $A_1, A_2$  = Ideal op amps,  $D_1 \sim D_4: V_D = 0.7V, r_D = 0 \Omega$ ) (20%)



7. Find the corresponding digital output  $Q = ?$  (10%)

