(請注意!! 答題務必按題號順序)

1. Answer the following questions as briefly as possible.
   (a) For the Zener diode circuit in Fig.1(a), does the R_S have the maximum or minimum value ? how about the R_L ? (6%)
   (b) For a PN junction (diode) under reverse bias, will the diffusion current I_{diff} increase or decrease or not change ? How about the drift current I_{drift} ? (6%)
   (c) For a n-channel MOSFET with body effect, if the bias voltage of source to substrate is increased, then the threshold voltage Vt of it will increase or decrease or not change ? (3%)

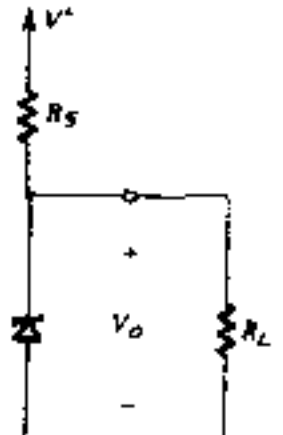

Fig.1(a)

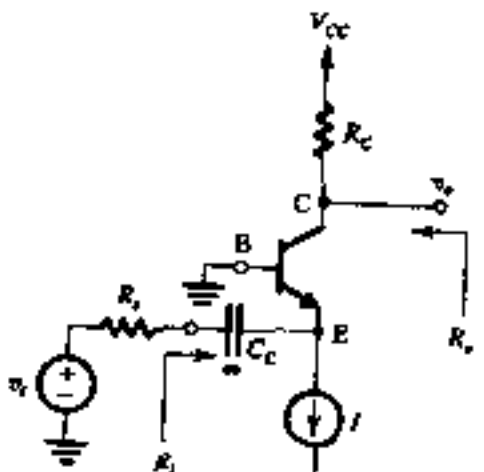

Fig.2

!. For the BJT in Fig.2 with $\beta = 100$, $g_m = 40$ mA/V, $r_o = \infty$, find the voltage gain Vo/Vs, input resistance Ri, and output resistance Ro. (9%)

i. Sketch a cascode current mirror circuit using MOSFET, and find the output resistance Ro of it. (10%)

. For Fig.4, the MOSFET with Cgs=Cgd= 1 pF, $g_m = 4$ mA/V, $r_o = \infty$. Approximately, find the mid-frequency voltage gain A_M, low 3-db frequency f_L, high 3-db frequency f_H. (16%)

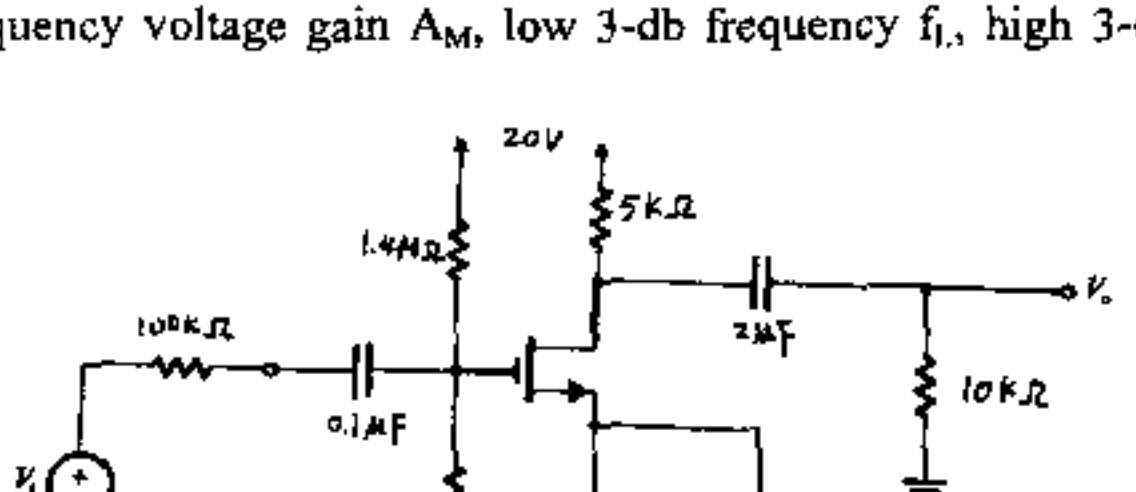

Fig.4

5. Show that for the circuit in Fig. 5, the current gain I_o/I_s is independent of R_L. (10%)

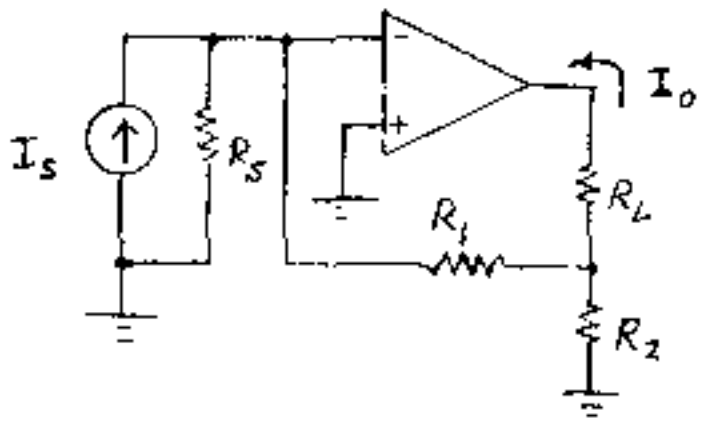

Fig. 5

6. Find the voltage transfer characteristic for the circuit shown in Fig. 6. (10%)

(CMOS Gates : $V_{th} = V_{DD}/2$)

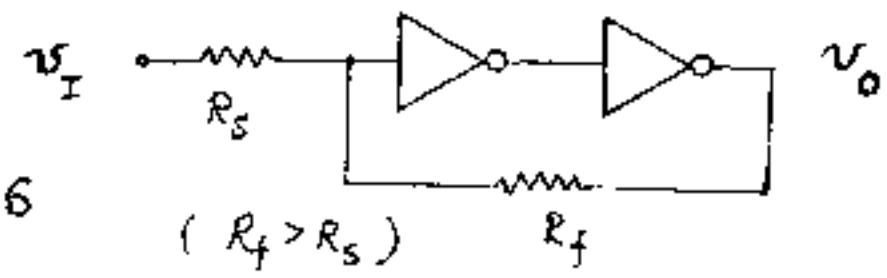

Fig. 6

($R_f > R_s$)

7, What is the waveform of the output? (10%)

(Gate Delay : t_p)

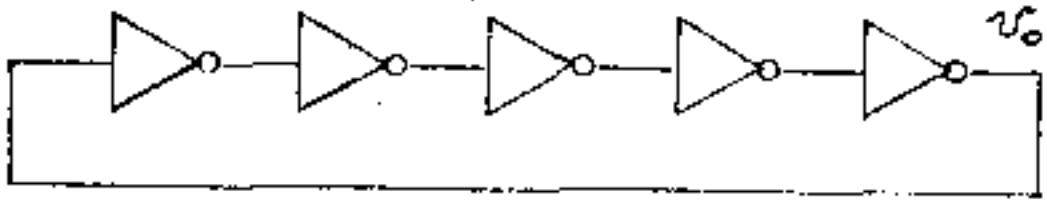

Fig. 7

8. Sketch the waveforms at the points shown in Fig. 8. (20%)

(CMOS Gates : $V_{th} = V_{DD}/2$)

(a) $R_s \gg R$

(b) $R_s = 0$

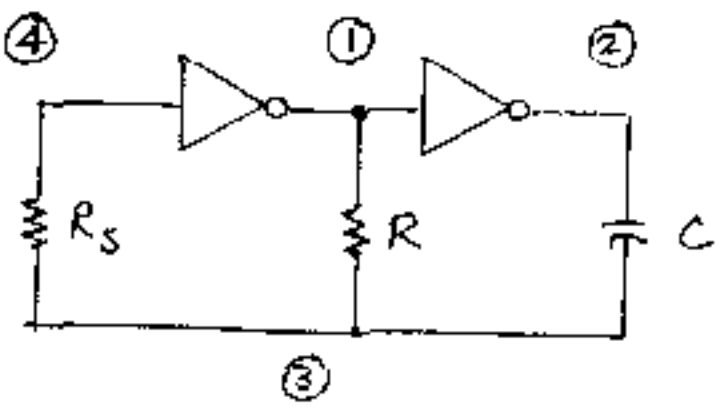

Fig. 8