Sheet 1: Revision

1)

a) For the current source shown in fig (1-a), derive an approximate expression for I_{o1} and I_{o2} as functions of V_{cc}. [Assume matched transistors]

b) If the current source of fig (p1-a) is replaced by the current source of fig (p1-b), find the new values of I_{o1} , I_{o2} as functions of V_{cc} [Assume matched transistors]

c) Which of the two circuits do you prefer from the point of view of IC fabrication?

d) For the source shown in fig(p1-c), find the relation between I_{out2}, I_{out3}, and I_{ref} [$W/L|_{M3}=2W/L|_{M1,M2}$]

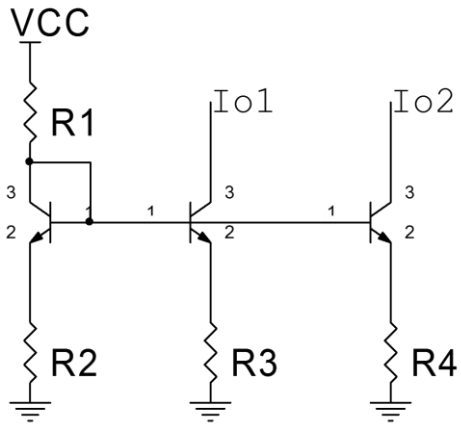

Fig (p1-a)

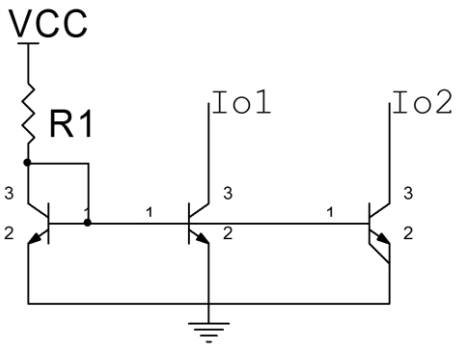

Fig (p1-b)

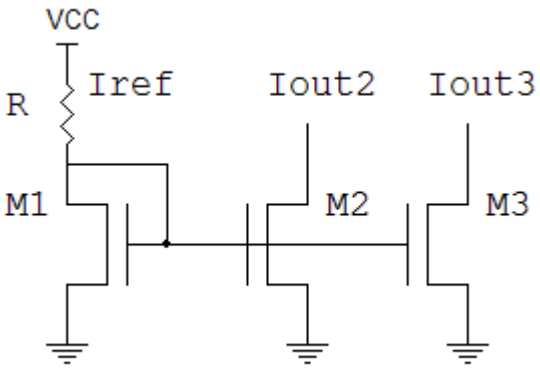

Fig (p1-c)

2) For the following circuit, draw the output in time domain and determine the maximum value of the signal, the input is a square wave signal alternating from 0 and 5V, draw the output for two cases:
a- Input frequency is 100 Hz.
b- Input frequency is 1 KHz.

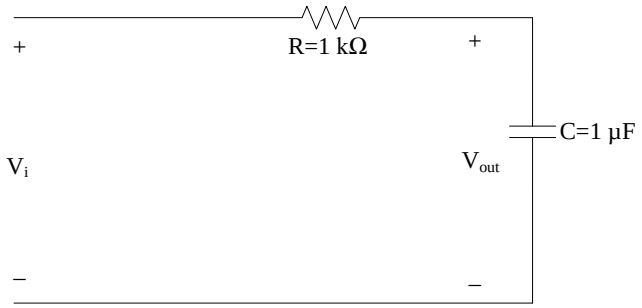

Fig (p2)

3) The following diode network is used to change the circuit output level from 15,-15 to 5,-5. For each circuit design the zener diode. If the maximum current that the opamp can supply is 5 mA, what is the minimum R value can be used?

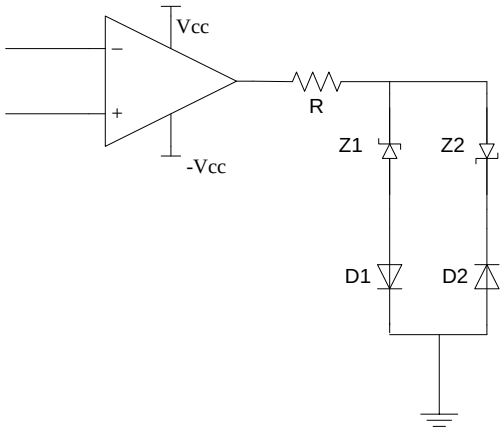

Fig (p3-a)

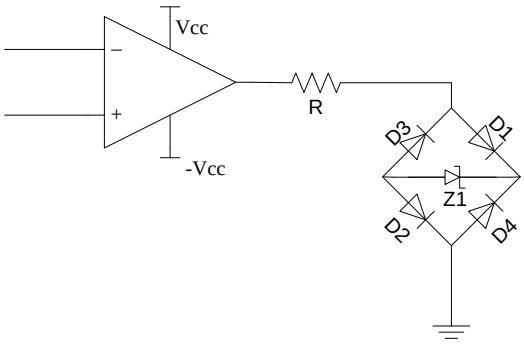

Fig (P3-b)

4) Draw the layout for the following circuits, state which circuit is better.

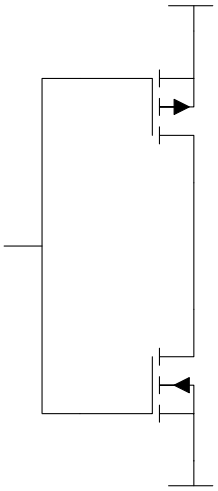

Fig (p4-a)

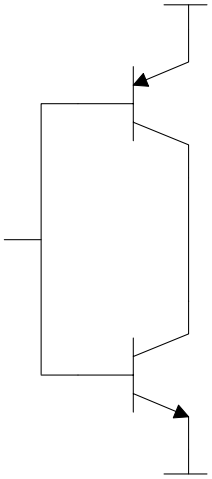

Fig (p4-b)