

## Open collector output

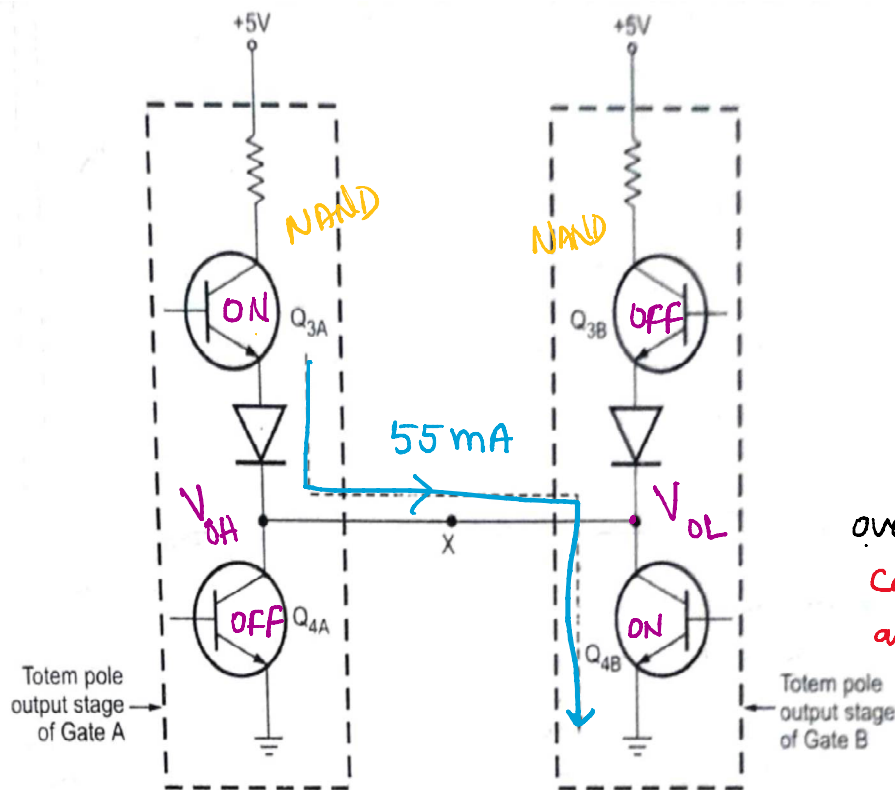


Fig. 7.19 Totem-pole outputs tied together can produce harmful current through  $Q_{3A}$  and  $Q_{4B}$

$Q_{4B}$  act as load for  $Q_{3A}$   
 $Q_{4B}$  is low resistance load,  
so it draws high current.  
This current may not  
damage  $Q_{3A}$  &  $Q_{4B}$   
immediately.

over a period of time  
can cause overheating  
and eventual device failure

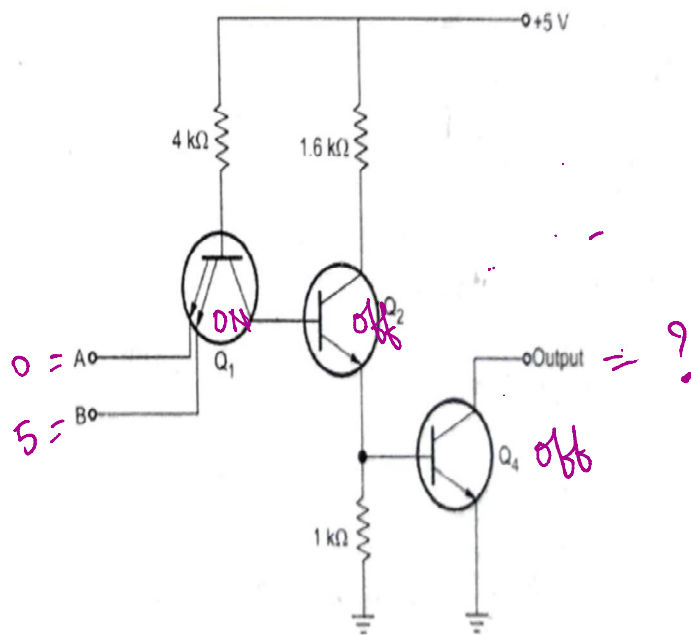


Fig. 7.20 Open collector 2-input TTL NAND gate

collector of  $Q_4$  open  
because of this it  
will not work properly  
To work properly,  
we need to connect  
external pull-up  
resistor

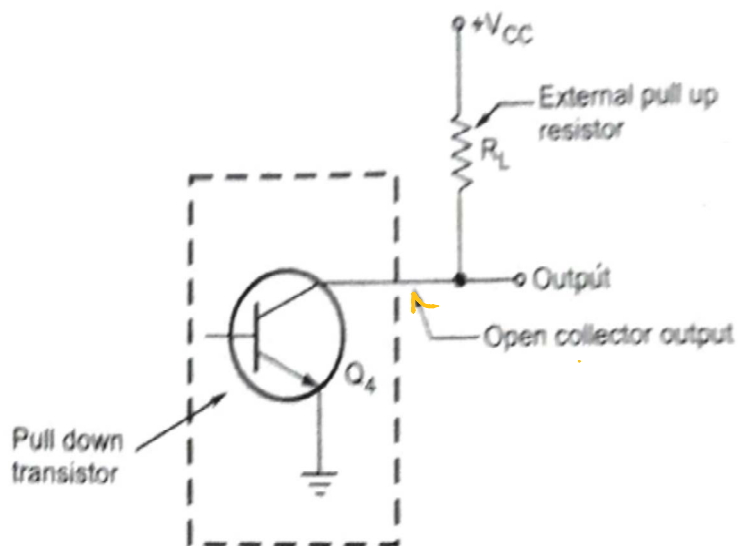


Fig. 7.21 Open collector output with pull-up resistor

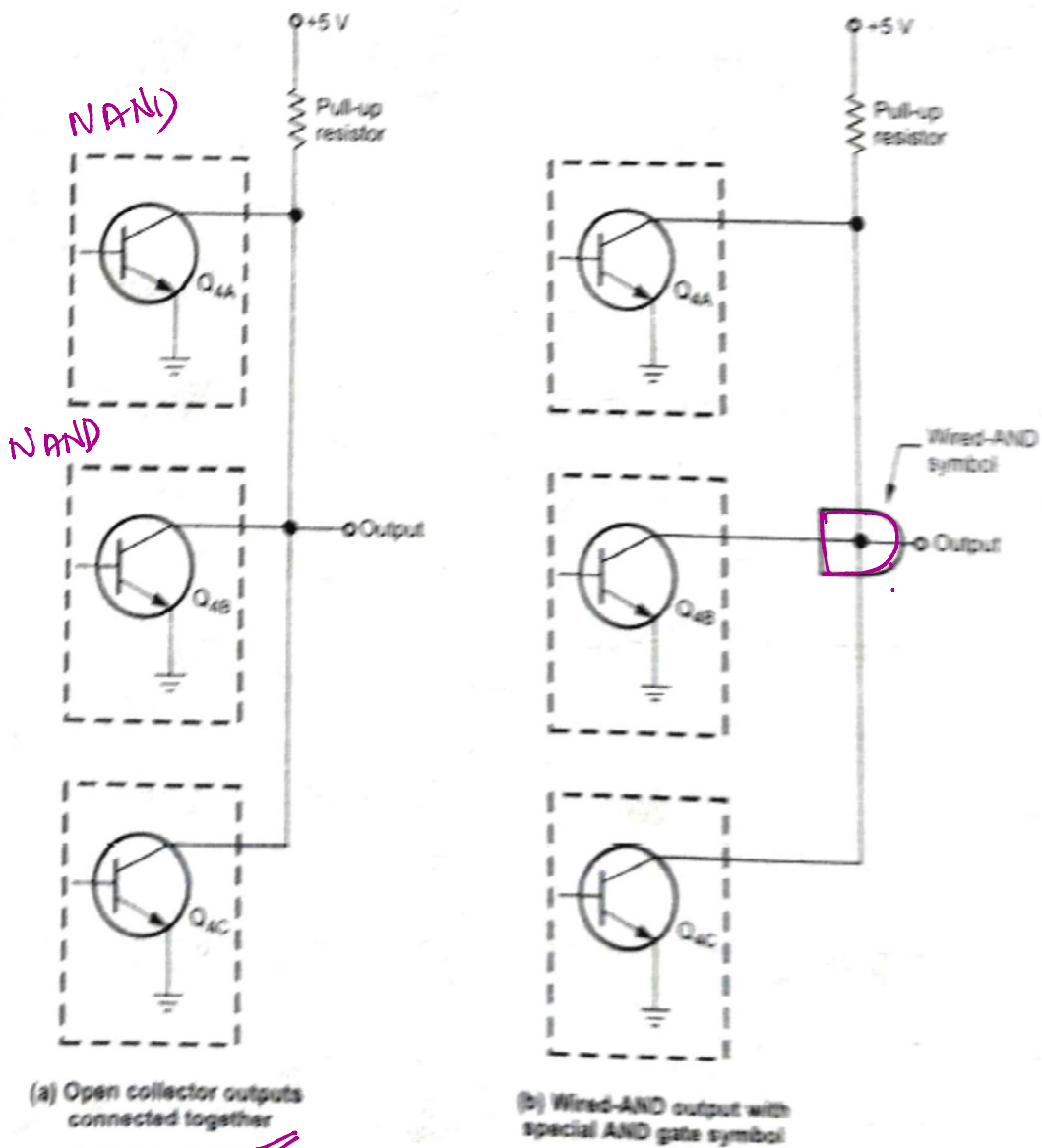


Fig. 7.22

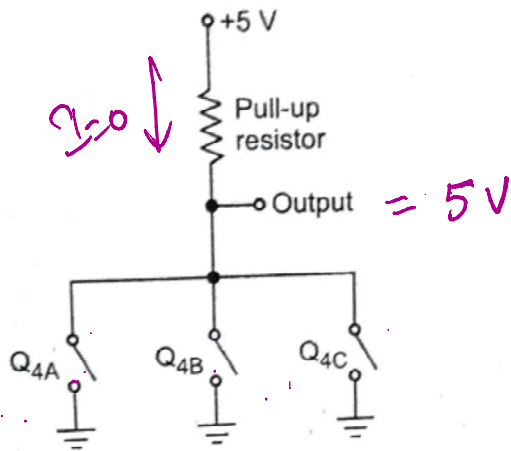
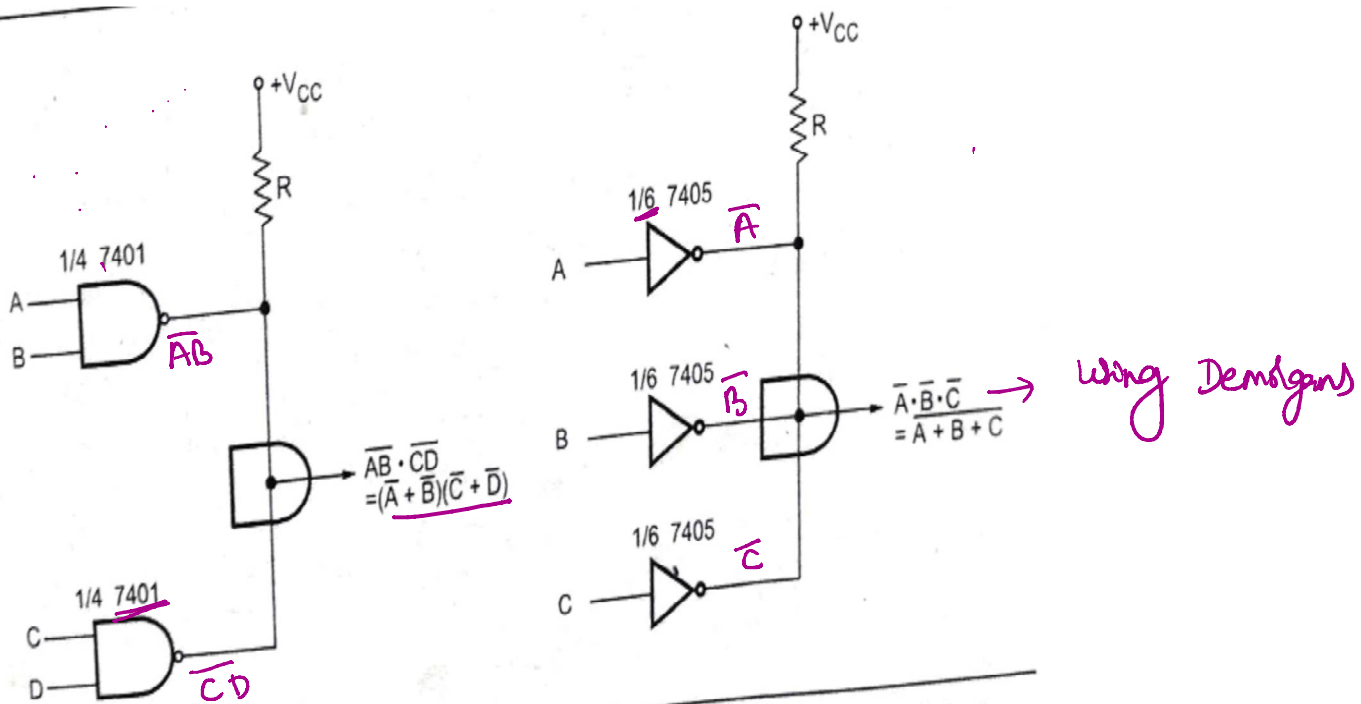
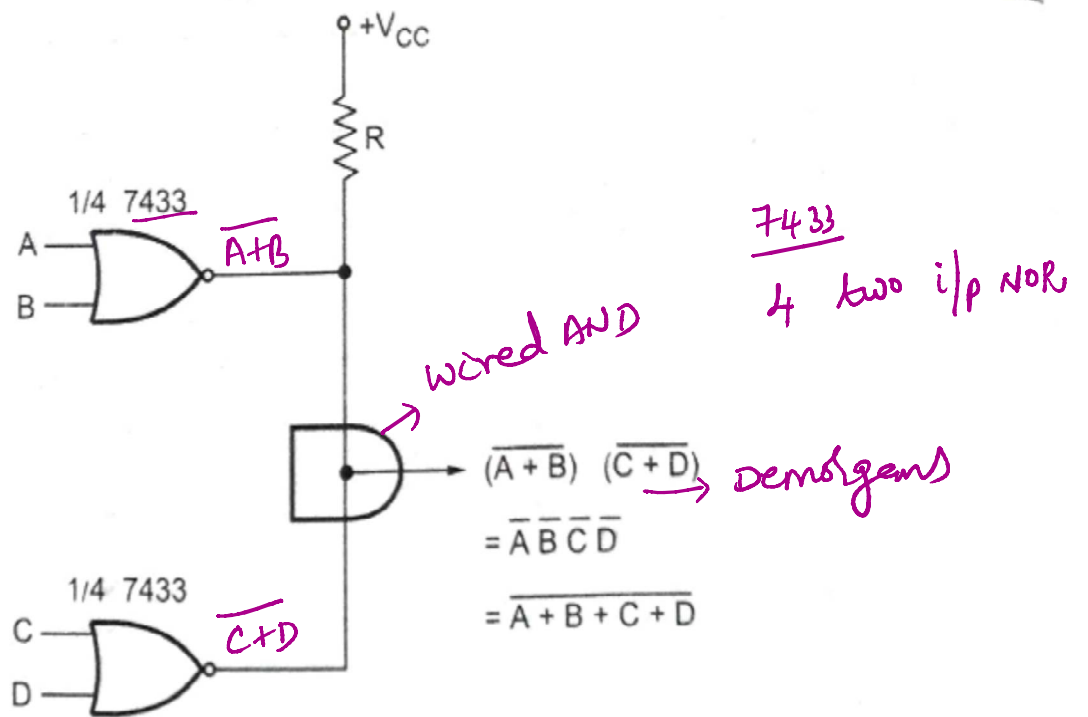


Fig. 7.22 (c) Electrical equivalent circuit for Fig. 7.22 (a) and (b)



(a) Wire-ANDed output of NAND gates Fig. 7.23 (b) Wire-ANDed output of inverters



(c) Wire-ANDed output of NOR gates  
Fig. 7.23 The wired-AND connections

## 7.6.14 Comparison Between TOTEM Pole and Open Collector Output

Table 7.9 summarizes the difference between totem pole and open collector outputs.

Totem Pole	Open Collector
1. Output stage consists of pullup transistor ( $Q_3$ ), diode resistor and pull down transistor ( $Q_4$ )	1. Output stage consists of only pull down transistor
2. External pull-up resistor is not required	2. External pull-up resistor is required for proper operation of gate
3. Output of two gates cannot be tied together	3. Output of two gates can be tied together using wired AND technique
4. Operating speed is high	4. Operating speed is low

Table 7.9 Comparison of Totem pole and Open Collector Output