**Homework 7**

1. Compare and contrast the basic TTL inverter in Figure 1 with corresponding RTL and DTL counterparts

Figure 1 (Basic TTL Inverter)



1. Compare and contrast the basic TTL NAND in Figure 2 with the corresponding DTL Design

Figure 2 (Basic TTL NAND Gate)



1. For the basic TTL inverter of Figure 1, determine

IIN, lRB, IB,O and IRC for the following conditions:

 VIN= 0 V

Let βF= 100, βR = 0.05, VBE(FA) = VBC(RA) = 0.7 V, VBE(SAT) = 0.8 V, and VCE(SAT) = 0.2 V for the BJTs.

1. For the basic TTL inverter of Figure 1, with VCC = 5 V, determine

IIN, lRB, IB,O and IRC for the following conditions:

 VIN= 0 V

Let βF = 100, VBE(FA) = VBC(RA) = 0.7 V, VBE(SAT) = 0.8 V, and VCE(SAT) = 0.2 V for the BJTs.

1. For the standard TTL NAND gate of Figure 3, calculate the following:
2. the input low current IIL
3. the output low current lOL
4. the maximum fan-out ≡ N = IOL/IIL
5. the average power dissipation

Use βF = 70, βR = 0.05, VBE (FA) = 0.7 V, VBE (S AT) = 0.75 V,

VBC(RA) = 0.7 V, and VCE(SAT) = 0.15 V.

Use *σ0* = 0.8 for the output low state.