

The circuit shown in FIGURE 3 is part of the interface of a relay output module.  $I_b$  is 1 mA and  $V_{CC}$  is 9 V. The relay requires a minimum of 50 mA to energise.

Complete the values of the assumptions listed below in order to calculate:

- voltage across  $R_1$
- value of  $R_1$
- voltage across the relay coil
- voltage across  $R_2$
- value of  $R_2$
- collector of current  $I_c$ .

Assumptions:

Logic '1' =        V

Logic '0' =        V

Transistor forward current gain  $h_{fe}$  =

LED current                        = 10 mA

LED voltage drop at 10 mA =    V

Base/emitter voltage =        V

Collector emitter voltage when transistor is on = 1 V

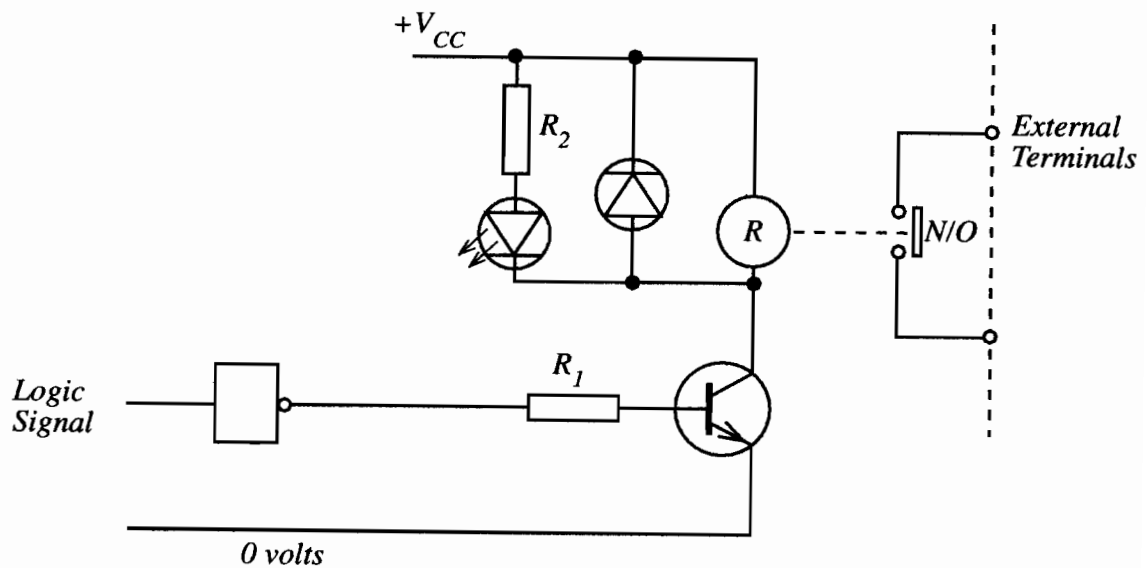


FIG. 3