Q1. In the given circuit in Fig. 1, for the transistor Q, base to emitter drop (VBE ON) is 0.7 V, Vce(sat) = 0.2 V and zener breakdown voltage is given to be 4.8 V.

a.) Calculate the value for the dc current gain β for Q? Take Rc = 330 Ohm. [10 Marks]

b.) What is the range of Rc for which Q1 will remain in active region. [15 Marks]

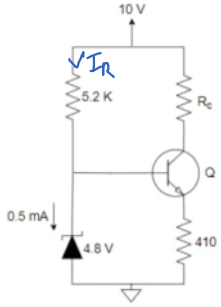


Fig. 1

Given:

Q1(a) $R_C = 330 (Ohm)$

Val breakdown = 4.8 V

$I_E = I_B + I_C \quad [I_C = \beta I_B]$

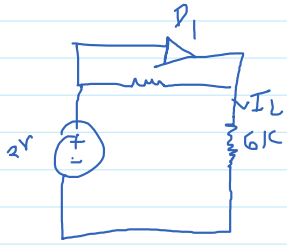
$I_R = \frac{10 - 4.8}{5.2K} = 1 mA$ (1)

Saturation

$I_C = \frac{10 - V_{CE\,sat}}{R_E} = 28.1 mA$

Now we have $\beta = \frac{I_C}{I_B} = \frac{28.1}{(1 mA - 0.5 mA)} = \boxed{56.2} = \beta$

Q2(a)



When diode is ON

$V = 2 - 0.7 = 1.3 V$

Solving using applying Nodal

$\frac{V}{6} + \left(\frac{2 - V}{2}\right) = I_{D_1} = 0$

$\boxed{I_D = -\frac{0.8}{6}}$

Now D_1 is Reverse biased

Q3)a) b) We can make NPN-BJT by connecting two PN junctions. here we will share +ve terminal as base and rest 2 terminal as emitter and collector