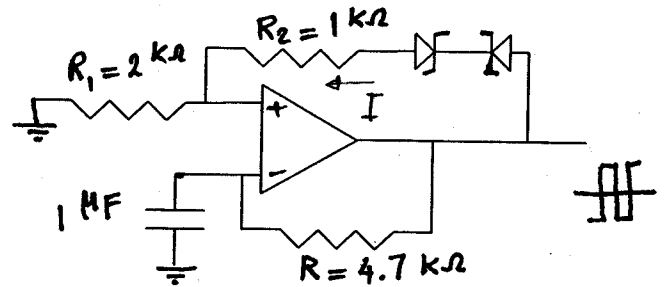3-20 points) In the square-wave generator circuit, the zener voltage in the reverse mode is 3[V] and in forward mode is 0.7[V]. The amplitude of the generated square wave is 10[V]. Find the frequency of oscillation.

$R_1 = 2 k\Omega$

$R_2 = 1 k\Omega$

I

$1 \mu F$

$R = 4.7 k\Omega$

Solution:

$$I = \frac{L_+ - (V_z + 0.7)}{R_1 + R_2} = \frac{10 - 3.7}{1 + 2} = 2.1 \, mA$$

$$V_+ = I \times R_1 = 2.1 \times 2 = 4.2 \, [v]$$

So V_+ switches between 4.2 and $-4.2 \, [v]$

$$\beta = \frac{4.2}{10} = 0.42$$

$$T = 2RC \ln \frac{1+\beta}{1-\beta} = 2 \times 4.7 \times 1 \times 10^{-3} \ln \frac{1+0.42}{1-0.42}$$

$$T = 8.42 \, ms$$

$$f = 118 \, Hz$$