(Q1 Bubba designed a RC phase shift oscillator using four RC networks in cascade with isolators in between as shown in Fig. Q1. The inverting amplifier provides the gain required for oscillation and also contributes 180° phase shift to loop gain.

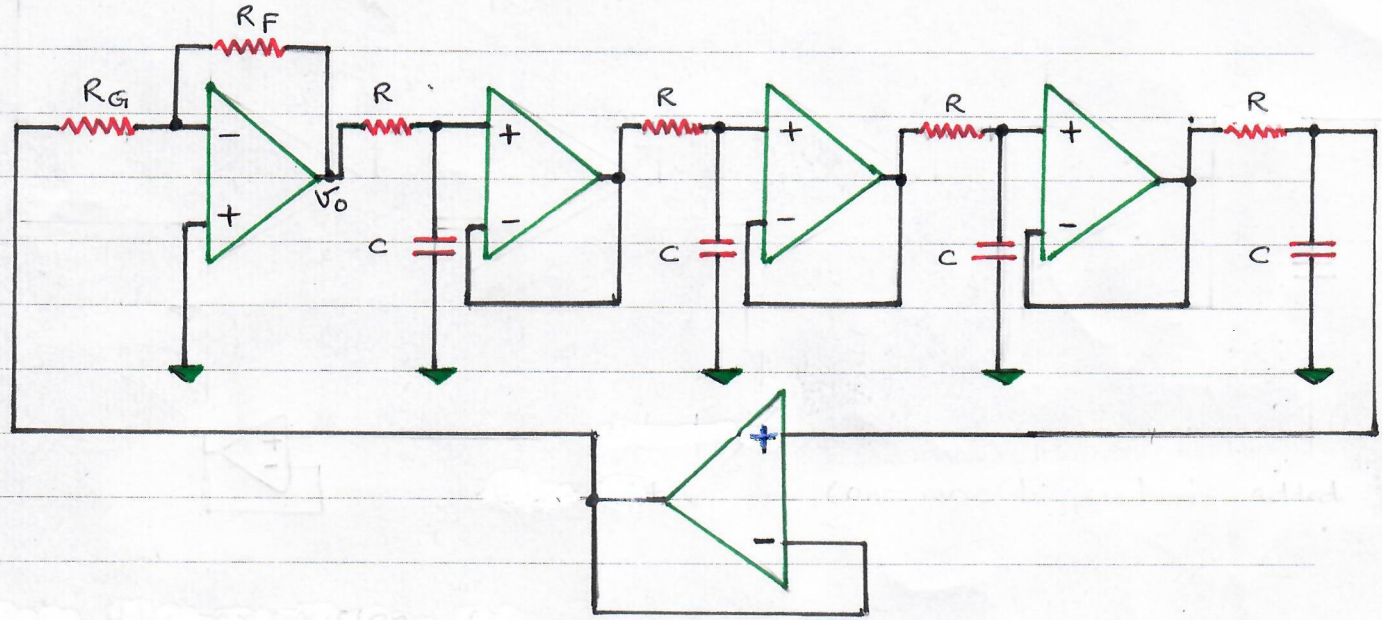

Fig. Q1

What will be the frequency of oscillation and the gain of the inverting amplifier for sustained oscillations?

Q2 Determine the incremental resistance of diode using the diode equation $i_D \simeq I_o e^{qV_D/KT}$ when $i_D = 50mA$.
The value of I_o is $10^{-14}A$ and $\frac{KT}{q} = 25 \times 10^{-3} A$.

Q3 For the op-amp circuit shown in Fig. Q3, derive the expression for output voltage if input voltage is $0.1 \sin(2\pi \times 1000 t)$ V. Sketch the output voltage waveform.

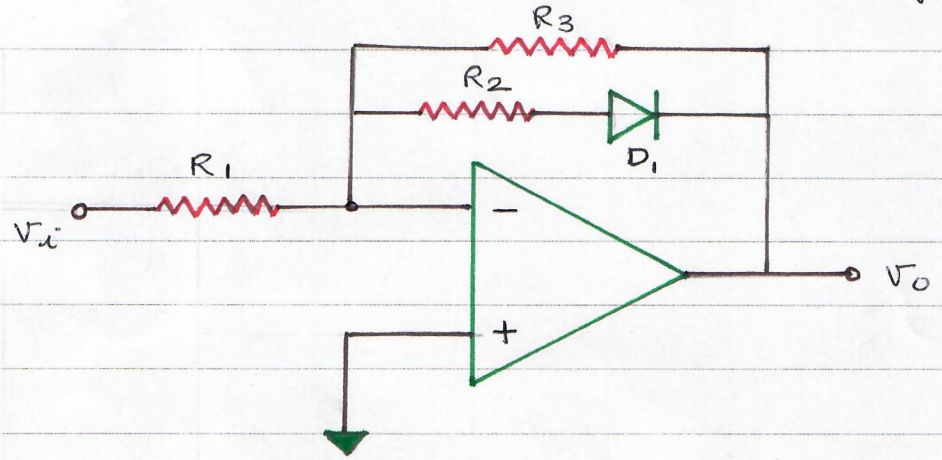

Fig. Q3

Assume that the op-amp and diode are ideal.

$R_1 = 1\text{K}\Omega$, $R_2 = R_3 = 100\text{K}\Omega$

Q.4. A Semiconductor diode having internal or forward resistance $r_f = 20\Omega$ and potential barrier $V_0 = 0$ is used for half-wave rectification. If the applied voltage $v = 50 \sin(\omega t)$ and load resistance $R_L = 800\Omega$, find

i) I_m, I_{dc}, I_{rms}, I_{ac}

ii) AC power input and dc power output

iii) DC output voltage

iv) efficiency of rectification

v) Ripple factor

(Q5). In adding 1A load to an existing 1A load, the output of a power supply drops from 10.5 to 10V. Calculate

i) output impedance of power supply and

ii) no-load voltage of power supply