Arab Academy for Science & Technology and Maritime Transport

College of Engineering and Technology

Department : Electronics and Communications

Course : Electronic Measurements **Course Code:** EC410

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Problem Set #4

Oscillators and LF Generators

1- A 5 V sin wave is fed from Wein bridge oscillator to the attenuator circuit illustrated in Fig.1. Calculate the values of R_a, R_b, and R_c to give output voltage ranges of 0-0.1 V and 0-1 V. The current drained from the oscillator is $1\,mA$ and the input bias current to the operational amplifier is $500\,nA$.

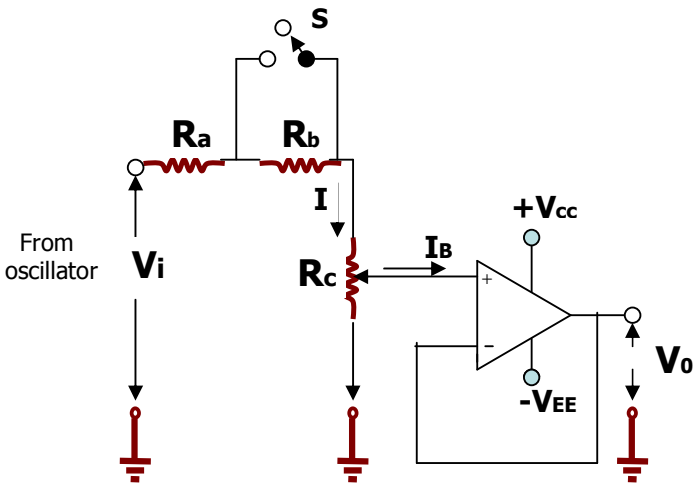


Fig. 1

2- A Wein bridge oscillator circuit, as shown in Fig. 2, has the following components: R changes from $500\,\Omega$ to $5\,k\Omega$ and C = $300\,nF$. Calculate the minimum and maximum output frequency. Explain how can you increase the frequency range by a factor of 20 (assume the same values of R).

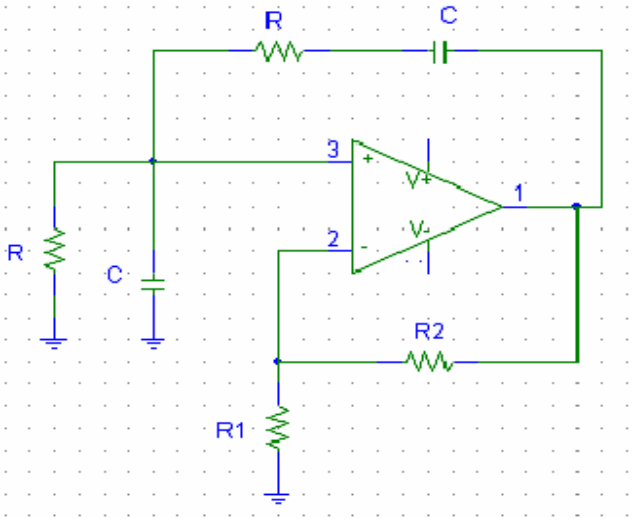


Fig. 2

3- A Wein bridge oscillator circuit, as in Fig. 2, has the following components: R changes from $200\,\Omega$ to $3\,k\Omega$ and C = $250\,nF$. Calculate the minimum and maximum output frequency and determine the new capacitor values required to give $f_{max} = 300\,Hz$.

4- The Wein bridge circuit modification is shown in Fig. 3 has $R_1 = 400\,\Omega, R_3 = 330\,\Omega$, and $R_4 = 470\,\Omega$. Determine the minimum and maximum values of the gain.

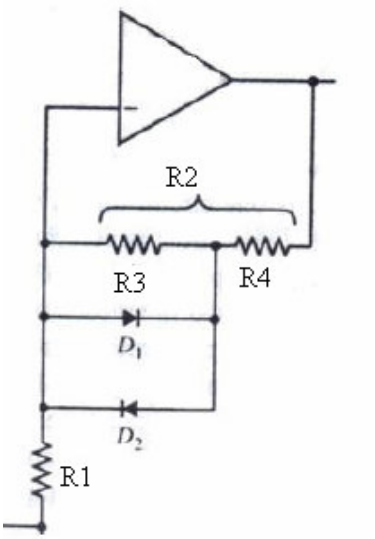


Fig. 3

5- For the LF square wave converter shown in Fig. 4, what is the function of the diodes. What is the value of the output voltage when:

(a) The zener diodes have $V_z = 7.1\,V$ and the diodes are Silicon types ($V_D = 0.7\,V$).

(b) The zener diodes have $V_z = 6.6\,V$ and the diodes are Germanium types ($V_D = 0.5\,V$).

(c) The zener diodes have $V_z = 7\,V$ and the diodes are ideal diodes ($V_D = 0\,V$).

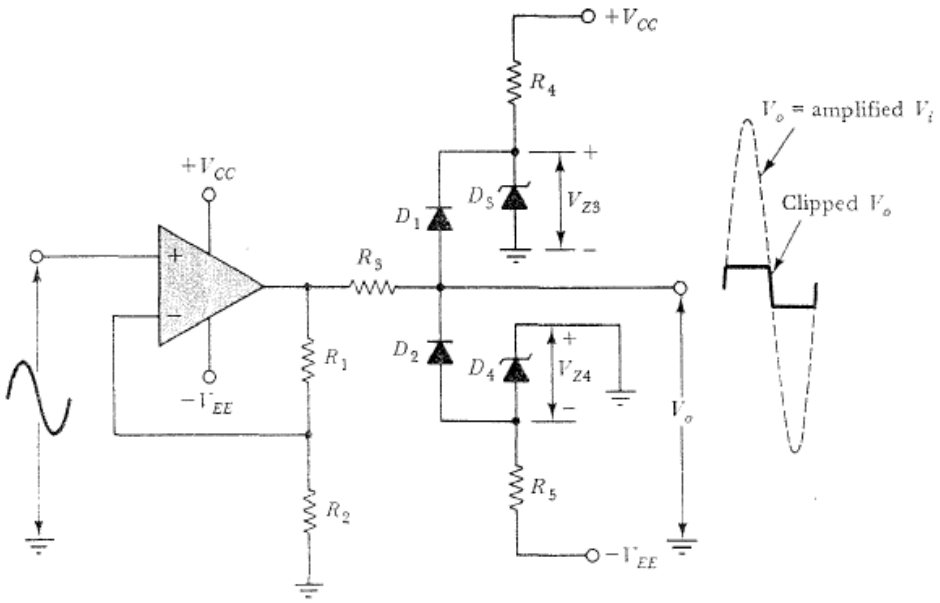
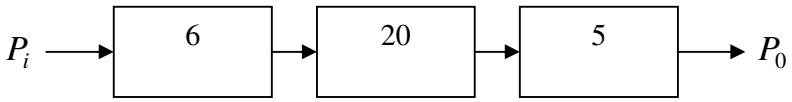


Fig. 4

6- For the shown block diagram:

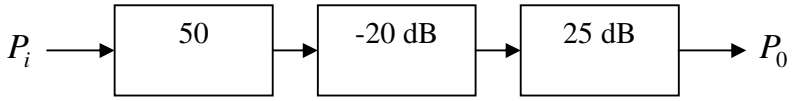


(a) What is the absolute value of the total gain.

(b) What is the value of the total gain in dB.

(c) If $P_i = 2W$, what is the input and the output power in dBm for each block

7- For the shown block diagram:



(a) What is the absolute value of the total gain.

(b) What is the value of the total gain in dB.

(c) If $P_i = 4W$, what are the input and the output power in dB for each block.

(d) Repeat (c) in case of dBm.