Assignment 5

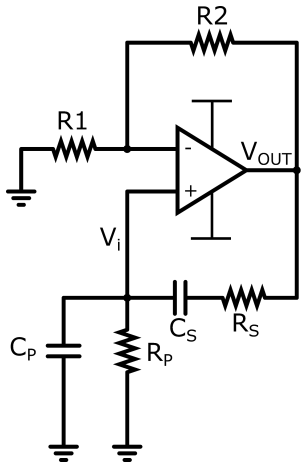
EE204 : Analog Circuits

Dept of Electrical Engineering, IITB
Autumn Semester 2023

TOTAL MARKS: **10**
SUBMISSION DEADLINE: **11:59 P.M., 14-10-2023**
MODE OF SUBMISSION: SCAN YOUR ASSIGNMENT AND UPLOAD ON MOODLE AS A SINGLE PDF FILE.

Q1. Design a Wein-Bridge Oscillator as shown with the following requirements:

- Frequency of Oscillation ω_0 should be **19/(1+x)**kHz, where x is the last digit of your roll number.
- Choose Rs/Rp=**1+x** and Cp/Cs =**1+x**, where x is the last digit of your roll number.
- Rs,Rp,R1,R2 > **1kohm** , Cp,Cs>**100pF**.



A. Determine the following to design the oscillator, assuming the opamp is ideal

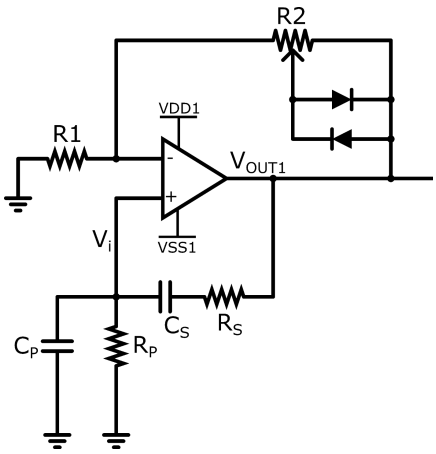
A.1. β(s) - Transfer function of the feedback path as a function of Rs, Rp, Cp and Cs (2m)

A.2. Values of circuit elements - Rs, Rp, Cp and Cs (2m)

A.3. Using values from A.2, find $\beta(j\omega_0)$ - feedback Transfer Function at ω_0 (1m)

A.4. Using values from A.2, find the ratio R2/R1 for sustained oscillations (2m)

B. The following amplitude control is implemented with all other circuit elements being the same as before, except R2 is now a potentiometer and two diodes are added across R2 as shown :



B.1. Choose R2/R1 so that it is greater than the ratio obtained in A.4 . Determine the values of R2, R1. (1m)

B.2. Find the setting on the R2 Potentiometer so that the output sine wave has an amplitude of 6V.
Given Vdd1=-Vss1=15V,
Diode current ID=Is*(exp(V/V_T)) where V_T=25mV,
Is=100nA, and V is the drop across the diode. (2m)