EEEN 202 Electrical and Electronic Circuits II
Homework 02

Due: Midterm Exam

Problem 1)

The difference amplifier is given in Figure P1.

a) Derive the expression of output voltage dependent to input voltages.
b) Compute the differential mode gain
c) Compute the common mode gain
d) Compute CMRR

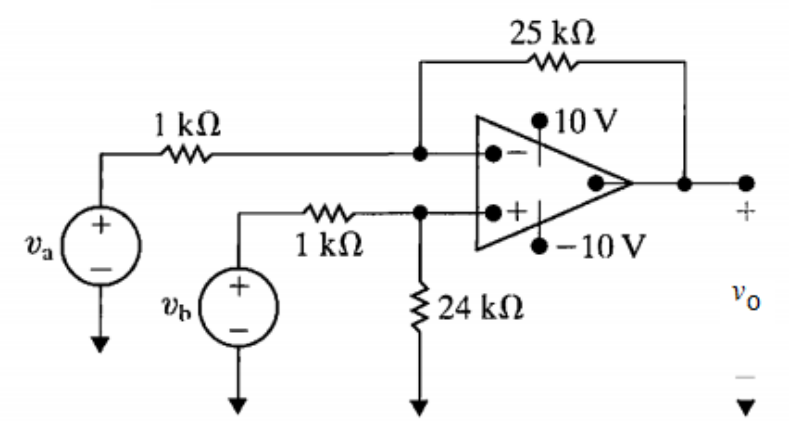

Figure P1

Problem 2)

For the circuit given in Figure P2, if the CMRR of the operational amplifier is 60 dB and differential mode gain (Ad) is 40 dB, then calculate the output voltage.

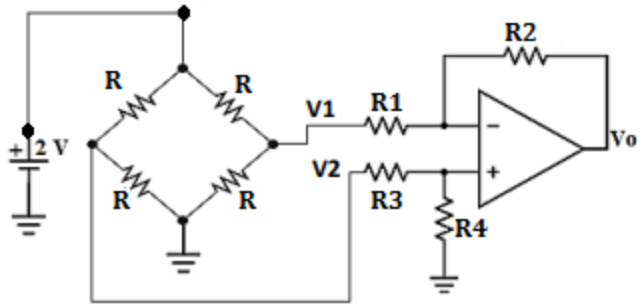

Figure P2

Problem 3)

The DC signal source shown in Figure P3 has a value of 880 mV. The op amp has an input resistance of 500 kΩ, an output resistance of 2 kΩ an open-loop gain of 100000.

a) Draw the realistic model of op amp indicating all component values.
b) Determine the Thevenin equivalent circuit seen from terminals a,b. Calculate V_{Th} and R_{Th}.

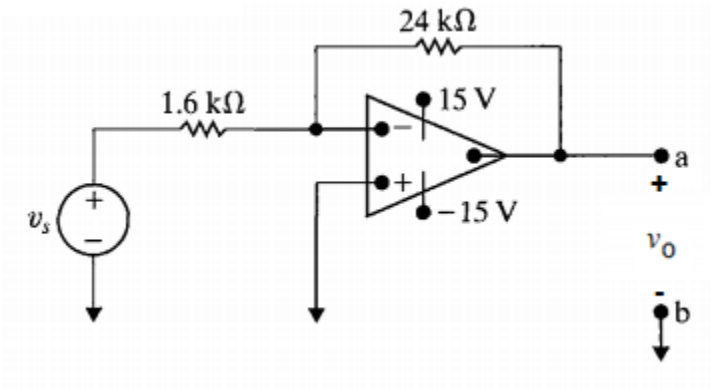

Figure P3

Problem 4)

Use a 500 nF capacitor to design a low pass filter with a cutoff frequency of 50 krad/s.

a) Determine the value of filter resistor. Draw the circuit indicating the component values and input and output voltages.
b) Assume that the cutoff frequency cannot increase by more than 5%. What is the smallest value of load resistance that can be connected to the output?
c) If the resistor found in (b) is connected to the output, what is the magnitude of transfer function when ω=0.

Problem 5)

The approximate magnitude and phase values of a passive filter circuit is given in the Table P5.

Table P5

Frequency (rad/s)	**Magnitude** (dB)	**Phase** (^{o})
50	-40	90
500	-20	90
4500	-3	45
10000	0	0

a) Find an expression for the output signal $v_o(t)$ when input signal is $v_s(t)=10 \sin(4500t+10^o)$

b) Find a steady-state expression for $v_o(t)$ when input signal is $v_s(t)=50 \cos(50t-45^o).u(t)$

c) Find a steady-state expression for $v_o(t)$ when input signal is $v_s(t)=15 \sin(10000t+55^o).u(t)$

d) Find a steady-state expression for $v_o(t)$ when input signal is $v_s(t)=32.u(t)$

What type of a filter is this?