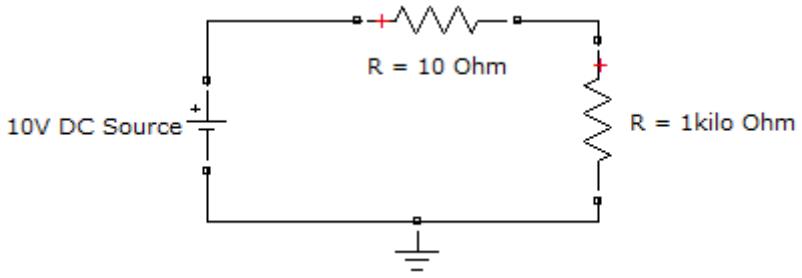
Expt. No – 1 Circuit Analysis using Multisim

Multisim integrates industry standard SPICE simulation with an interactive schematic environment to instantly visualize and analyze electronic circuit behavior.

Introduction to Multisim schematic

Example: Determine the voltage and current across the load resistance (1kΩ).



Invoke **NI Multisim 14.1.**

A. Drawing the schematic

File >> New Design >> Blank; Create a new design; Worksheet appears.

i. Get all components and place them on the worksheet.
   Toolbar → Place → Component → Select a component → Basic → Resistor.
   Double click on the resistor on the screen to change the value.
ii. Similarly, place the remaining components as given in the circuit on the worksheet.
iii. Connect all components as in circuit diagram.
   Place → Wire
iv. Save the schematic in the directory.

B. Analysis

i. Simulate → RUN.
ii. Note down the simulated results and compare the same theoretically.

Problem 1: Verify Kirchhoff current and voltage laws for the circuit shown in Fig. 1.1.

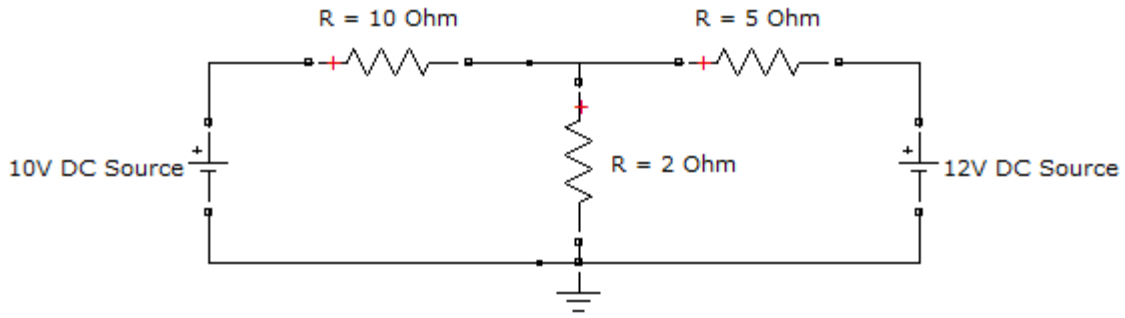


Fig. 1.1

Problem 2: Find the current passing through the current dependent voltage source shown in Fig. 1.2.

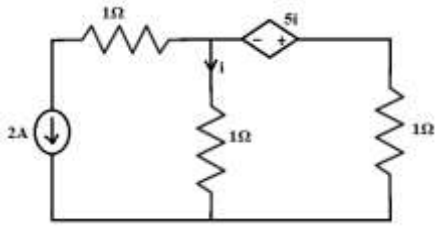


Fig. 1.2

Problem 3: Design a series resonant circuit for a resonant frequency of 5kHz. Let Resistor, R = 5.6kΩ and Capacitor, C = 0.01μF. Take input voltage $V_{in} = 2V_{pp}$. Plot the frequency response and measure the bandwidth. Compare the simulation results with that of the theoretical values.

Problem 4: For an R||L||C anti – resonant circuit, plot the frequency response and obtain the resonant frequency. (Refer problem 3).

Expt. No – 2 Network Theorems and Transient response Analysis

1) *Network Theorems (DC Circuits):*

Problem 1: Using Thevenin's theorem, obtain the load current passing through the terminals A & B shown in Fig. 2.1. Assume $R_L = 100\Omega$.

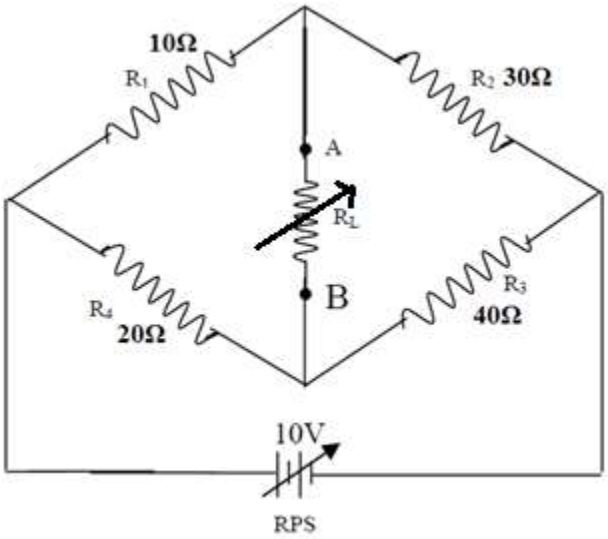


Fig. 2.1

Problem 2: Determine the value of R_L for the circuit shown in Fig. 2.1, so that maximum power is delivered from the source (RPS).

2) *Transient Response Analysis:*

Problem 3: Obtain the inductor current and inductor voltage for a series RL circuit.

Assume, Resistor, R = 10 Ohm, Inductor, L = 0.5H, Source = 10V. Perform the simulation assuming the (a) Zero initial condition (b) $i(0^-) = 0.2A$.

Problem 4: Obtain the capacitor current and capacitor voltage for a series RC circuit.

Assume, Resistor, R = 10 Ohm, Capacitor, C = 10μF, Source = 10V. Perform the simulation assuming the (a) Zero initial condition (b) $V_c(0^-) = 5V$.

Expt. No – 3 Simulation of basic electronic circuits using Multisim

Problem 1: Observe and plot the output of the half wave rectifier circuit given in Fig. 3.1.

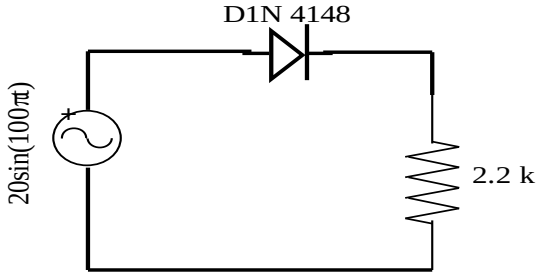


Fig. 3.1

Problem 2: Observe the output of the bridge rectifier circuit of Fig. 3.2. Plot the output voltage for different values of capacitor C (50µF, 100µF &150µF). Consider D1N4148 diode.

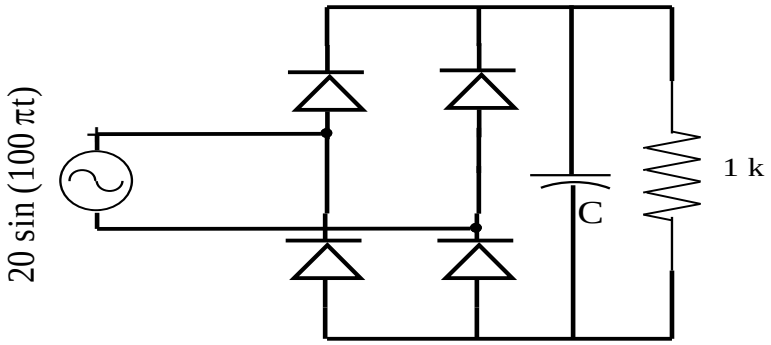


Fig. 3.2

Problem 3: Observe the output of the Zener voltage regulator shown in circuit Fig. 3.3. Plot the output voltage for different values of capacitor C. Consider D1N4148 diode for D_1 to D_4 and 1N750A as Zener diode. C=10µF, 2200µF, R_S=50Ω, R_L =1KΩ.

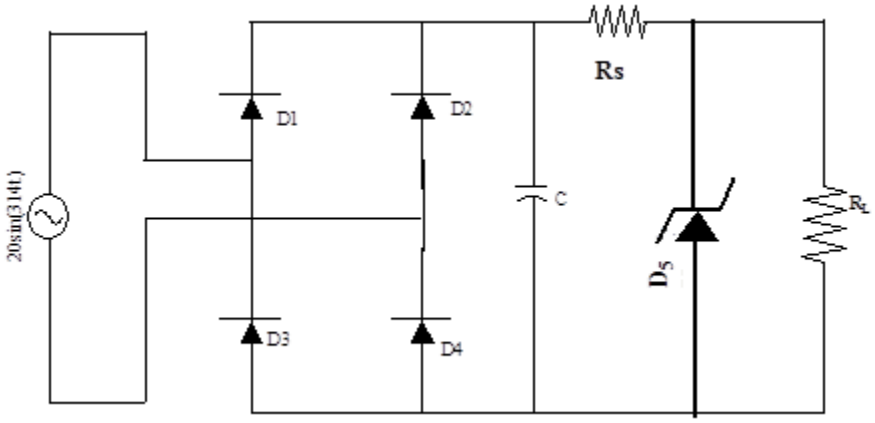
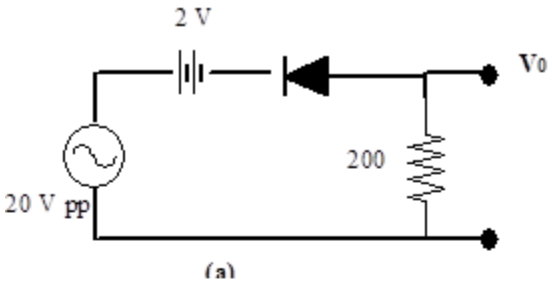
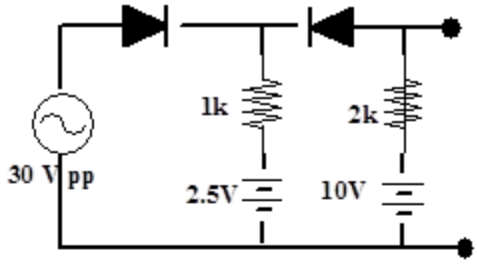


Fig. 3.3

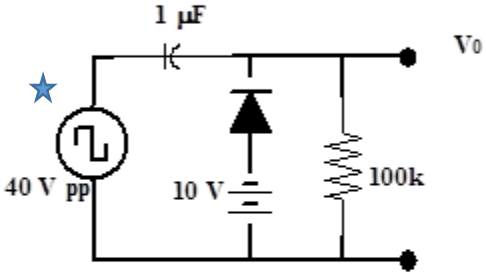
Problem 4: Observe the output waveform for the following circuits.



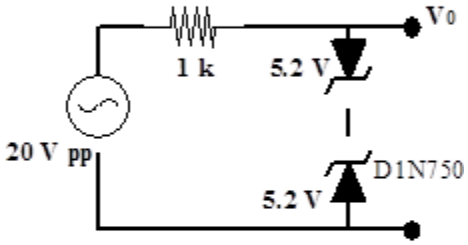
(a)



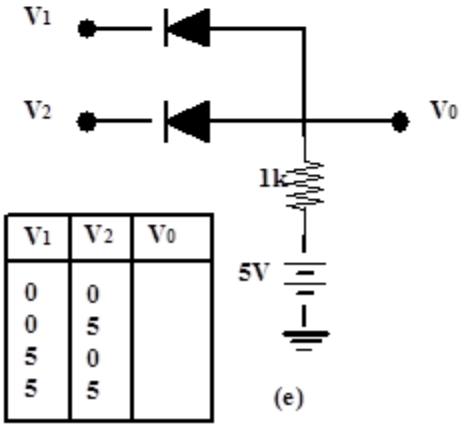
(b)



(c)

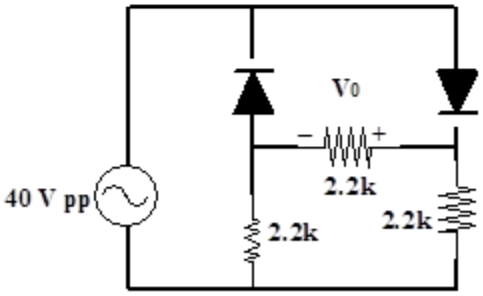


(d)



V1	V2	V0
0	0	
0	5	
5	0	
5	5	

(e)



(f)

V_1	V_2	t_d	t_r	t_f	tw	per
-20	20	0	1n	1n	50m	100m

Expt. No – 4 Familiarization of analog circuits

Problem 1: For an RC - Coupled amplifier shown in Fig. 4.1, plot the frequency response characteristics. Observe the output signal with respect to the input signal. Obtain the bandwidth of the amplifier. Also compare the voltage gain with and without bypass capacitor C_E.

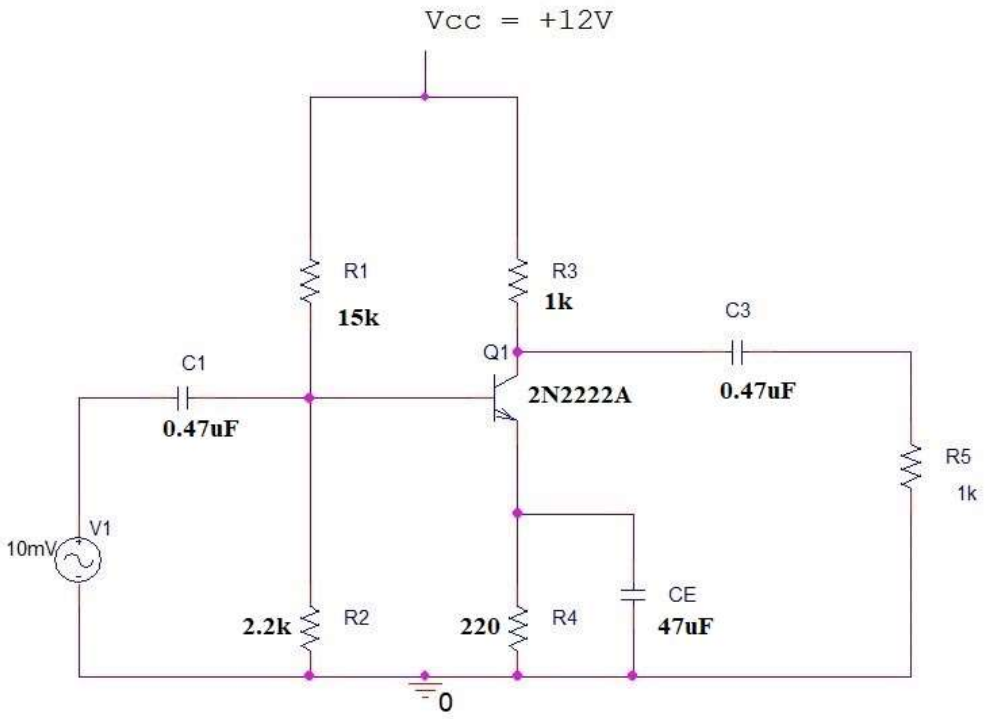


Fig. 4.1

Problem 2: With reference to Problem 1, plot the frequency response characteristics for a two - stage RC coupled amplifier. Obtain the bandwidth of the amplifier. Observe the output signal with respect to the input signal.

Problem 3: For the circuit shown in Fig. 4.2, repeat the analysis as mentioned in Problem 1.

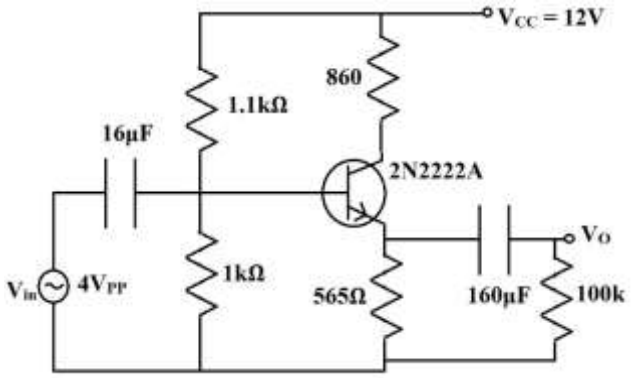


Fig. 4.2

Problem 4: For the circuit shown in Fig. 4.3, prove that the current passing through R_1 is the same as the collector current of the transistor Q_2. Use suitable values of V.

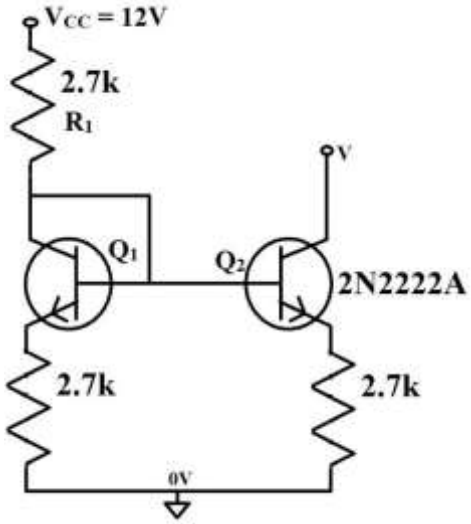


Fig. 4.3