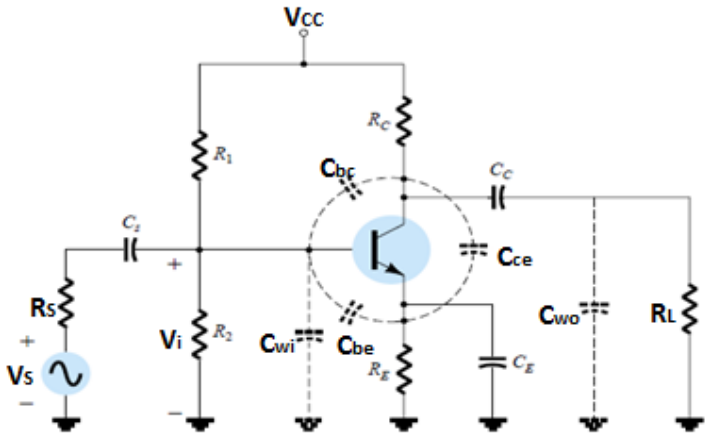
EXPERIMENT NO. -05

Aim of the Experiment:

To design a common emitter amplifier and to find its frequency response curve.

Theory:



Frequency response of an amplifier is the graph between gain and its frequency. The voltage gain of an amplifier varies with signal frequency due to effect of variation in the circuit capacitive reactance with signal frequency on the voltage output. The curve drawn between the voltages gain and signal frequency of an amplifier is known as frequency response. If the input voltage of an amplifier is kept constant but its frequency is varied it is observed that the amplifier gain:

i) Remains practically constant over a sizable range of mid frequency

ii) Fall of gain at low as well as high frequency

The performance of an amplifier depends on its frequency response, the amplifier should be operated in its bandwidth range and the falls of amplifier gain at low frequency is due to the effect of coupling and bypass capacitors. At medium and high frequencies the capacitive reactance Xc being equal to $1/2\pi fc$ is very small and therefore all coupling and bypass capacitors behave as short circuit .At low frequencies capacitive reactance of capacitor Xc increases and some of the signal voltage is lost across the capacitors. Thus with decrease in frequency the reactance of capacitor increases and therefore the gain of the circuit falls.

Low frequency band:

In the low frequency region of the single stage BJT or FET amplifier, it is the RC combinations formed by the network capacitors C_C, C_E and C_S and the network resistive parameters that determine the cut off frequencies. In low frequency band gain drops at frequencies lower than f_L. Large capacitors can no longer be treated as short circuit. The gain roll-off is mainly due to coupling and by-pass capacitors.

Mid frequency band:

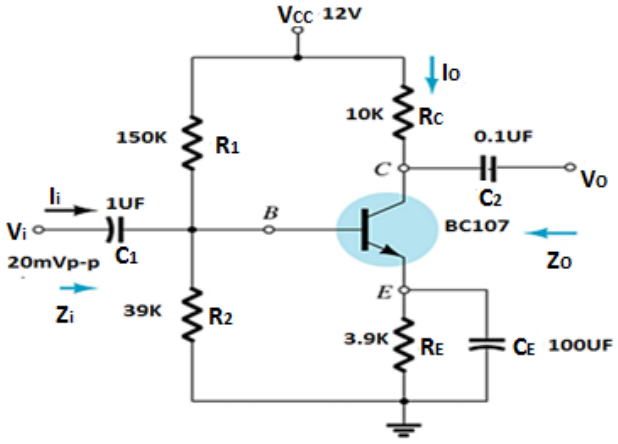
In the mid frequency band the effects of the capacitors are minimal and can be neglected. Large capacitors can be treated as short circuit and small capacitors can be treated as open circuit. Gain is almost constant and can be obtained by small signal analysis.

High frequency band:

Gain drops at frequencies higher than f_H. Small capacitances can no longer be treated as open circuit. The gain roll-off is mainly due to parasitic capacitances of the MOSFETs and BJTs. The various parasitic capacitances of the transistor are included with the wiring capacitances (Cwi, Cwo). At very high frequencies, the capacitive reactance of C_O will decrease and consequently reduce the total impedance of the output .The net result is that V_O will also decline towards zero as the reactance X_C becomes smaller.

Graph has to plot using a semi log graph sheet so that entire range of frequencies can be easily represented. It is a graph plotted between gain in db and frequency. We have to mark cut off points where gain falls -3db. Bandwidth of the graph will be, $B.W. = f_H - f_L$

Practical circuit:



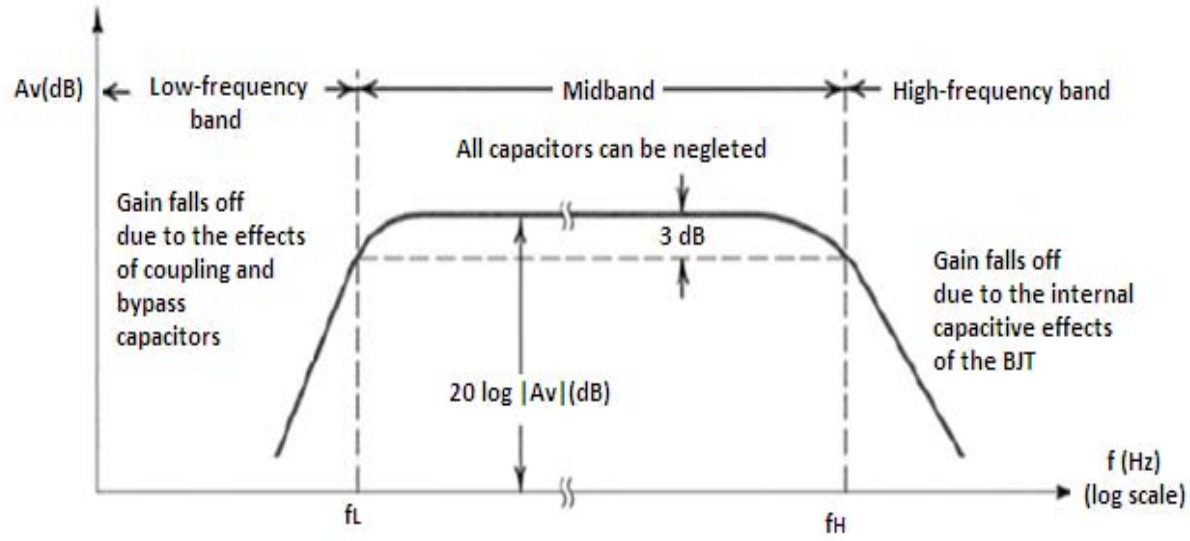
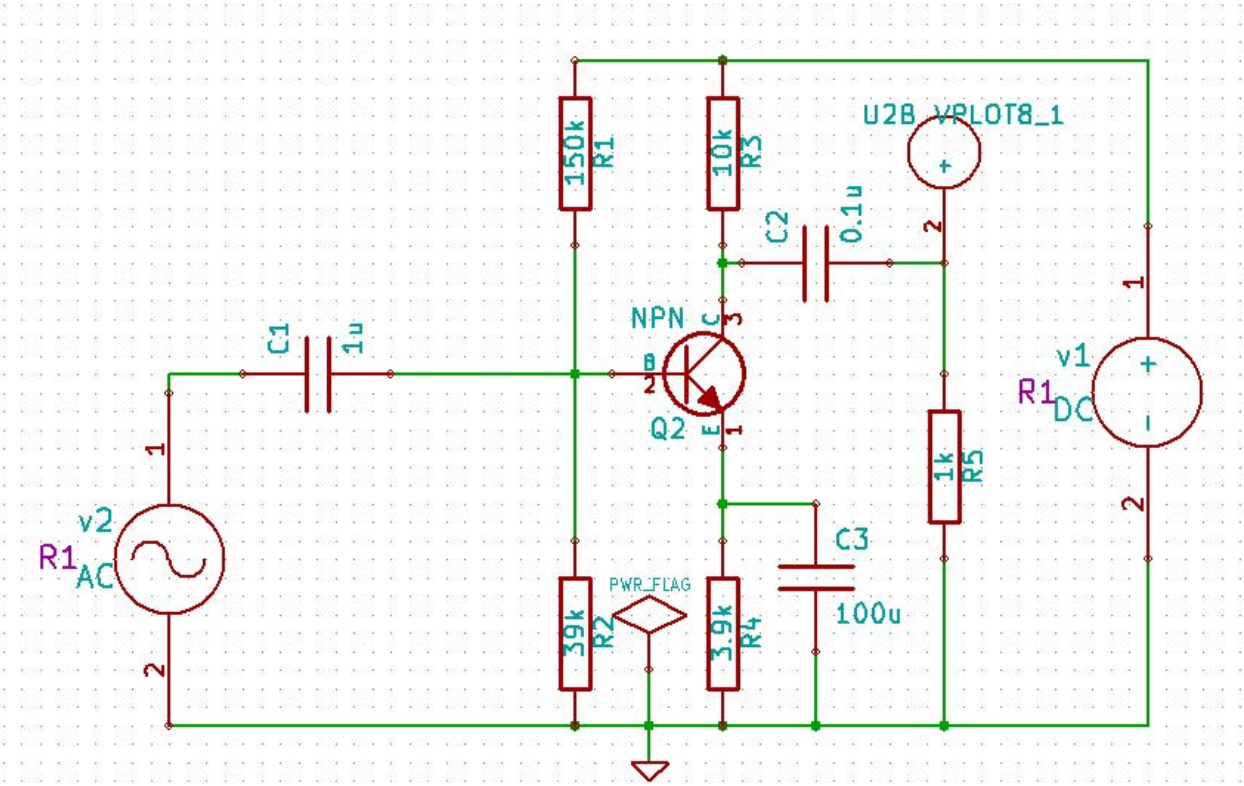
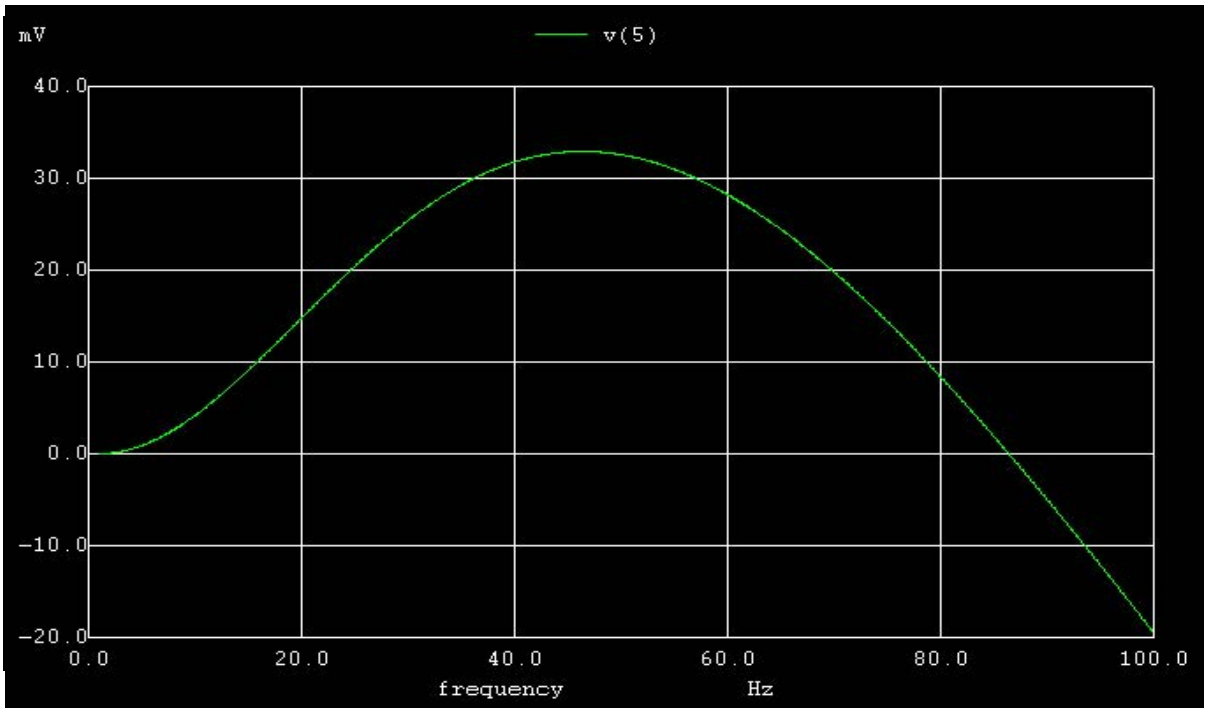


Figure: Frequency Response Curve

Schematic Circuit:



Output Waveform:



Conclusion:

Date: **Signature of the Student**

NAME:

ROLL NO.:

GROUP ID:

SUB GROUP NO.:

Experiment Mark: **/ 20** **Instructor's Signature**