SIVAPRASAD A S
TCR19EC051

AMPLIFIER DESIGNING

PURPOSE OF DESIGN:-

For amplifying human voice signals to make others hear clearly while wearing face masks.

FREQUENCY RESPONSE RANGE:- 20Hz -20kHz

POWER OUTPUT REQUIRED:- 12 Watts

SPECIFICATION OF MICROPHONE AND LOUDSPEAKER:-

MICROPHONE

- Microphone 9*7mm
- Model name - SKU: 699586
- Frequency Range: 50 – 20KHz
- Microphone sensitivity 56 – 58DB
- Low noise
- Low power consumption

SPEAKER

- Power Rating - 6W
- Impedance - 8 ± 15%
- Output SPL - 95 ± 3 dBA
- Frequency Range- 230–12000 Hz

PART NUMBER OF TRANSISTOR USED:- 2N3904

CALCULATIONS:-

Calculations

* Mid band frequency gain = 50
* Transistor used → 2N3904
* Maximum Rating :- $V_{CB} = 60V$ $V_{CE} = 40V$ $V_{EB} = 6V$
  $I_C = 200\,mA$
* Nominal Rating :- $V_{CE} = 1V$ $I_C = 10mA$ $h_{FE} = 100 - 300$
* ouput swing = 10V

→ $V_{CC} = 12V$ $V_{CE} = 6$

$V_{RC} = 4.8V$ $V_{RE} = 1.2V$

→ Design of R_C → $V_{RC} = I_C R_C$

$$R_C = \frac{4.8}{10mA} = 480\,\Omega$$

→ Desgn of R_E ⇒ $V_{RE} = I_E R_E$

$$R_E = \frac{1.2}{10mA} = 120\,\Omega$$

→ Design of R_2 ⇒

$I_B = 100\,\mu A$

$V_{R2} = 9 I_B R_2 = .6 + 1.2$

$$R_2 = \frac{1.8}{9 \times 100\,\mu A} = 2k\Omega$$

→ Design of R_1 ⇒

$V_{R1} = V_{CC} - V_{R2} = 12 - 1.8 = 10.2 = I_B R_1$

$$R_1 = \frac{10.2}{110 \times 10\,\mu A} = 10.2k\Omega$$

→ Design of R_L ⇒

$$50 = \frac{R_L \,||\, 480}{\frac{R_L + 480}{2.5}} \qquad R_L = 169\,\Omega$$

$$\frac{1}{R_i} = \frac{1}{2\times10^3} + \frac{1}{10.2\times10^3} + \frac{1}{252.5}$$

$$R_i = 219\,\Omega$$

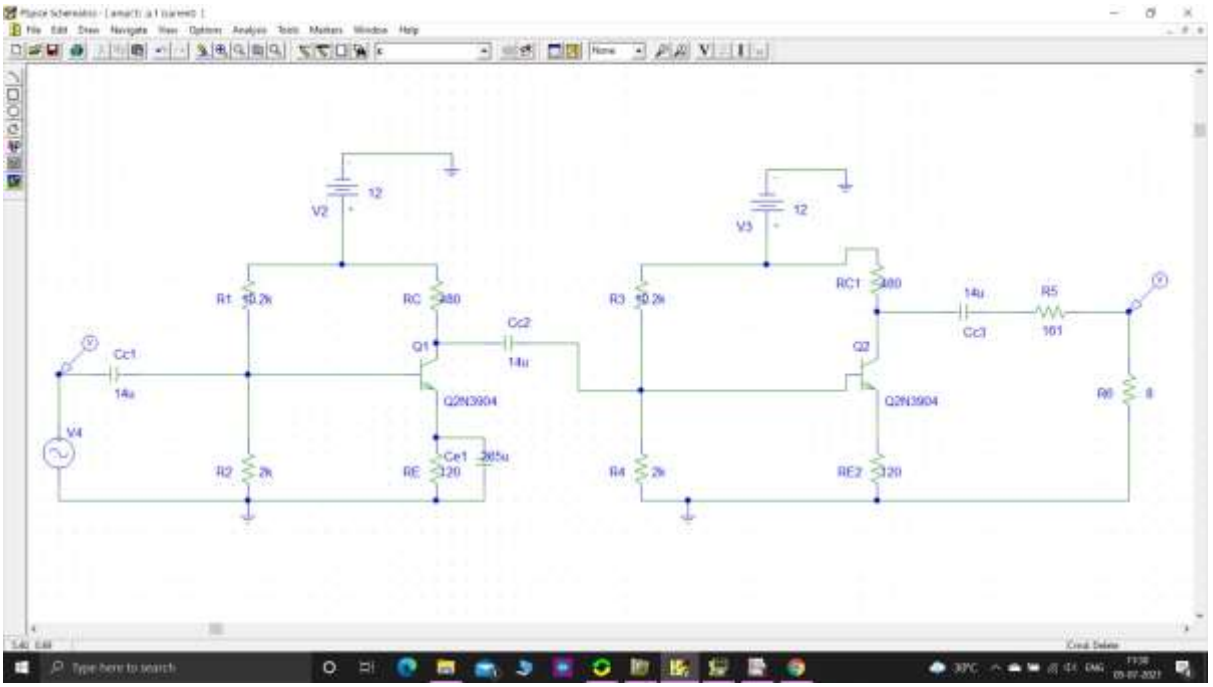
→ Let lower cutoff frequency = 50Hz

$$C_{C1} = C_{C2} = \frac{1}{2\pi \times 219 \times 50} = 14\,\mu F$$

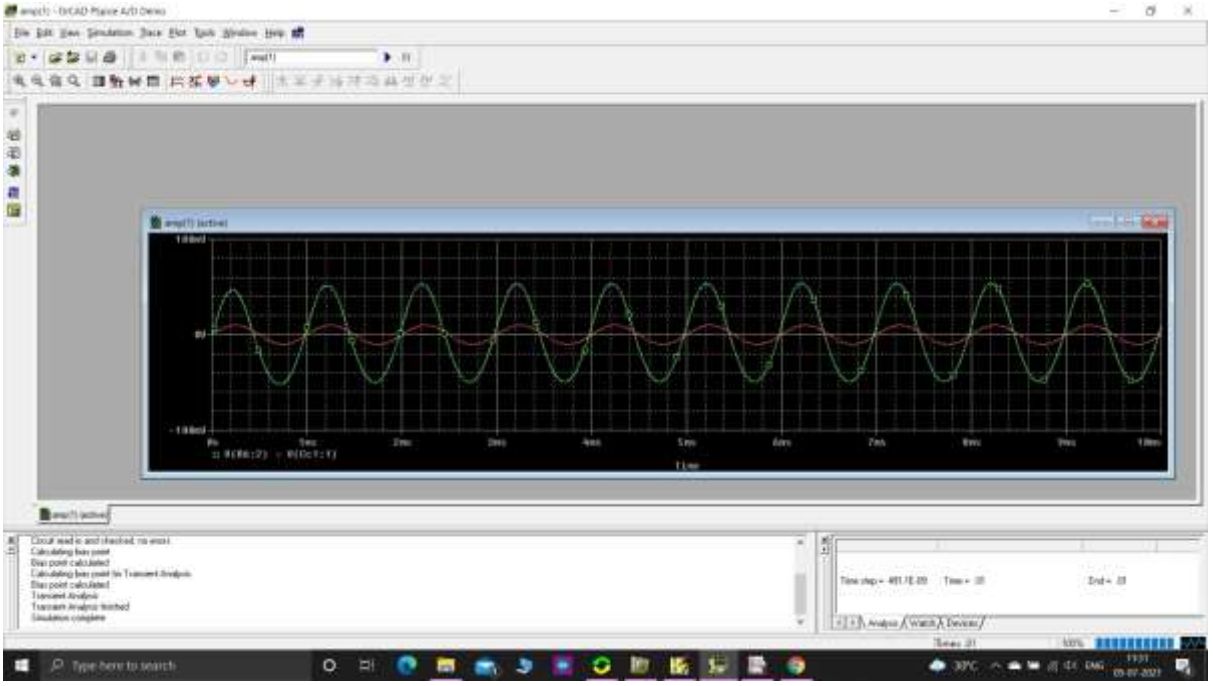
$$C_E = \frac{1}{2\pi \times 50 \times 12} = 265\,\mu F$$

$X_{CE} = \frac{R_E}{10}$

DESIGN:-



OUTPUT:-



FREQUENCY RESPONSE:-