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| Course Name: | **Electronic Circuits Analysis and Design** | **Semester:** | **IV** |
| **Date of Performance:** | **18-01-2021** | **Batch No:** | **B2** |
| **Faculty Name:** | **Prof. Sonia Joshi** | **Roll No:** | **1912052** |
| **Faculty Sign & Date:** |  | **Grade/Marks:** | **/25** |

**Experiment No: 1**

**Title: To study the frequency response of a BJT amplifier.**

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| **Aim and Objective of the Experiment:** To study the frequency response of a BJT amplifier.  1) Bypass  2)Unbypass |
| 1) To calculate maximum gain.  2) To calculate lower cut off frequency, higher cut off frequency and bandwidth from frequency response. |

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| **COs to be achieved:** |
| CO1: Learn the dependency of the amplifier gain over the frequency range |

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| **Theory:** |
| The BJTwhen used as an amplifier has the ability to amplify a signal. But the amplification factor achieved is not constant for all the frequencies. The gain of a BJT amplifier is the highest in mid frequency and is almost constant for a considerable range. It rolls off in both low and high frequency. The low frequency roll off is primarily due to coupling capacitor (CS) and by-pass capacitor (CE). These capacitors help attenuate the incoming signal, since they exhibit high reactance at low frequency. The stray capacitance effect limits the high frequency response of a BJT amplifier. But in mid-frequency the coupling and by-pass capacitors act as short-circuit and junction capacitances act as open –circuit. The frequency versus gain is plotted in a semi-log paper to analyse the 3-dB point and hence the lower cut-off frequency, upper cut-off frequency and bandwidth is calculated from the graph. |

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| **Circuit Diagram:** |
| Bypassed    Unbypassed |

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| **Stepwise-Procedure:** |
| 1. Make the connections as per the Circuit diagram.  2. Apply the sinusoidal input signal to the circuit.  3 Observe transient response of the circuit  4. Apply AC signal at the input of the circuit  5. Observe the Frequency response of the circuit  6. Calculate maximum gain and lower cut off frequency, higher cut off frequency, bandwidth theoretically and practically. |

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| **Observation Table:** |
| **A) Bypass**  **1) Transient response**   |  |  |  |  | | --- | --- | --- | --- | | **Sr No** | **Input Signal** | **Vo(Thr)** | **Vo(Prac)** | | **1.** | **40mV (p-p)** | **3.543V** | **3.4637283V** |   **2) Frequency Response**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Sr No** | **Input Signal frequency** | **Vo (Volts)** | | **Gain in dB** | | **1.** | **10 Hz** | **-32.076525dB** | **23.86372dB** | | | | **2.** | **100 Hz** | **-4.5725048dB** | **35.62852dB** | | | | **3.** | **1 kHz** | **7.4482079dB** | **39.78962dB** | | | | **4.** | **10 kHz** | **8.0964285dB** | **40.89521dB** | | | | **5.** | **100 kHz** | **7.8725673dB** | **40.19273dB** | | | | **6.** | **1 MHz** | **-1.5678205dB** | **37.18926dB** | | | | **7.** | **10 MHz** | **-20.975265dB** | **29.90672dB** | | |   **3) fL,fH, Bandwidth**  **fL = 164.43337 Hz**  **fH = 1.54356 MHz**  **Bandwidth = 1.54 MHz**  **B) Unbypass**  **1) Transient response**   |  |  |  |  | | --- | --- | --- | --- | | **Sr No** | **Input Signal** | **Vo(Thr)** | **Vo(Prac)** | | **1.** | **40mV (p-p)** | **72.2mV** | **70.28926mV** |   **2) Frequency Response**   |  |  |  |  | | --- | --- | --- | --- | | **Sr No** | **Input Signal frequency** | **Vo (Volts)** | **Gain in dB** | | **1.** | **10 Hz** | **-41.027962dB** | **33.349821dB** | | **2.** | **100 Hz** | **-32.379765dB** | **35.327893dB** | | **3.** | **1 kHz** | **-32.097654dB** | **35.983621dB** | | **4.** | **10 kHz** | **-32.098765dB** | **36.097625dB** | | **5.** | **100 kHz** | **-32.179732dB** | **35.975241dB** | | **6.** | **1 MHz** | **-32.189625dB** | **35.245782dB** | | **7.** | **10 MHz** | **-36.397294dB** | **29.178962dB** |   **3) fL,fH, Bandwidth**  **fH =**2.9251189MHz  **fL =**23.594509Hz  **Bandwidth=2.92 MHz** |

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| **Calculation:** |
| **A.C. Analysis:** |

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| **Waveform** |
| **Bypassed**    Unbypassed    Bypassed    Unbypassed |

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| **Post Lab Subjective/Objective type Questions:** |
| 1. **Why do we use semi-log paper?**   In a semi-log graph the y-axis is logarithmic, which means the seperation between the ticks on the graph is proportional to the logarithm of numbers. The x-axis has a linear scale, which means the ticks are evenly spaced. A semi-log graph is useful when graphing exponential functions.   1. **Why gain falls at low frequencies in case of BJT amplifier?**   The gain of capacitor goes low at lower frequencies due to the reactance that is offered by Capacitor that is present in the coupling at this frequency in the circuit   1. **What is the rate of roll-off in a single stage BJT amplifier?**   In all basic single order amplifier and filter circuits this roll-off rate is defined as 20dB/decade, which is an equivalent to a rate of 6dB/octave. |

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| **Conclusion:** |
| We studied the frequency response of a BJT amplifier |

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| **Signature of faculty in-charge with Date:** |