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| **Course Name:** | **Basic Electronic Circuits** | **Semester:** | **III** |
| **Date of Performance:** | **5-10-2020** | **Batch No:** | **B2** |
| **Faculty Name:** | **Prof. Bharathi Khedkar** | **Roll No:** | **1912052** |
| **Faculty Sign & Date:** |  | **Grade/Marks:** | **/25** |

**Experiment No: 7**

**Title: Study of BJT CE amplifier**

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| **Aim and Objective of the Experiment:** |
| To Study BJT CE amplifier as an amplifier |

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| **COs to be achieved:** |
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| **Theory:** |
| Common emitter (CE) amplifier is widely used in audio frequency applications in radio and televisions receivers. It provides current, voltage and power gains. For the proper functioning of an amplifier, the transistor must be biased in the active region where the base current has a complete control over the collector current. Thus a small increase in the base current results in a relatively large increase in the collector current and a small decrease in the base current is followed by a large decrease in the collector current. An NPN transistor is connected as a common emitter ac amplifier in which the voltage divider bias is employed. The name ‘voltage divider’ comes from the voltage divider network formed by the resistors R1 and R2. The voltage divider bias provides good stabilization so that the operating point can be made independent of the variation in hFE. This is achieved by properly selecting the resistor values R1 and R2. The input resistance of the amplifier Ri = R1 || R2 || (1 + hFE) re with bypass capacitor CE is connected and Ri = R1 || R2 || (1 + hFE) (re + RE) with CE is removed. Here re is the internal emitter resistance of the transistor. The resistance re is given by the expression.  𝑟𝑒 = 𝑉𝑇 𝑅𝐸 Where VT = 25mV, i.e., the equivalent thermal voltage at room temperature. The output resistance of the amplifier, RO ≈ RC, where RC is the collector resistance. The purpose of the bypass capacitor CE is to bypass signal current to the ground. The ac signal (feedback voltage) developed across the emitter resistor RE is bypassed through the capacitor CE. Thus the gain of the amplifier increases, since this bypassing reduces the negative feedback across RE. This implies that when the bypass capacitor CE is connected, gain increases and bandwidth decreases and when it is disconnected, gain falls and bandwidth increases. The purpose of the coupling capacitors CC1 and CC2 is to couple the ac signal to the input and output of the amplifier respectively. Meanwhile they block the dc signal and also determine the lowest frequency which is to be amplified. When only one transistor with associated circuitry is used for amplification, the circuit is known as single stage transistor amplifier. In short, the various circuit elements and their functions are as below. The resistors R1 and R2 form the biasing network, this biasing network is used to maintain the operating point (Q) in the centre of the load line. RE is used for negative feedback, to stabilize the gain. CC1 & CC2 are used for coupling and CE is used for bypassing RE. The output is an amplified version of input but, with a phase shift of 180°. |

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| **Circuit Diagram/ Block Diagram:** |
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| **Stepwise-Procedure:** |
| 1. Open a new Schematic. 2. Draw the Circuit As Shown. 3. Note down the parameters as per the observation table. |

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| **Observation Table:**  **V(vcc): 20 voltage**  **V(c\_vedant): 13.8767 voltage**  **V(e\_vedant): 3.09229 voltage**  **V(vout\_vedant): 1.38766e-005 voltage**  **Ic(Q1): 0.00153084 device\_current**  **Ib(Q1): 1.53083e-005 device\_current**  **Ie(Q1): -0.00154614 device\_current**  **I(C1): 3.09229e-016 device\_current**  **I(Cc2): -1.38766e-017 device\_current**  **I(Cc1): 3.87753e-018 device\_current**  **I(R4): 0.00153084 device\_current**  **I(R3): 0.00154614 device\_current**  **I(R2): 0.000403062 device\_current**  **I(R1): 0.000387753 device\_current**  **I(V2): -0.0019339 device\_current**  **I(V1): 3.87753e-018 device\_current** |
| |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | **Vin** | **Vout** | **Vout** | **Av**  **(bypassed)** | **Av**  **(bypassed)** | **Av**  **(unbypassed)** | **Av**  **(unbypassed)** | |  | **(bypassed)** | **(unbypassed)** | **Cal** | **Sim** | **Cal** | **Sim** | | **20mV** | **-4.577 V** | **-39.171 mV** | **-241.68** | **-228.85** | **-1.9836** | **1.9585** | |

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| **Calculation:** |
| 1. Av (bypassed) and Av(un-bypassed) |

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| **Waveform** |
| Input and output waveforms  BYPASSED    UNBYPASSED |

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| **Post Lab Subjective/Objective type Questions: (hand written)** |
| 1. The units of voltage gain is a) It has no units, it is a ratio b) Decibels (db) c) All of the mentioned d) None of the mentioned  2. A transistor has hie =2kΩ, hoe=25µmhos and hfe=60 with an unbypassed emitter resistor Re=1kΩ. What will be the input resistance and output resistance?    3. Which of the following acts as a buffer? a) CC amplifier b) CE amplifier c) CB amplifier d) cascaded amplifier  4. In an NPN silicon transistor, α=0.995, IE=10mA and leakage current ICBO=0.5µA. Determine ICEO. a) 10µA b) 100µA c) 90µA d) 500µA |

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| **Conclusion: (to be written in own words)** |
| CE amplifier is used to increase the strength of a signal in terms of voltage current and power |

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