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| **Course Name:** | **Basic Electronic Circuits** | **Semester:** | **III** |
| **Date of Performance:** |  | **Batch No:** | **B2** |
| **Faculty Name:** | **BPK** | **Roll No:** | **1912052** |
| **Faculty Sign & Date:** |  | **Grade/Marks:** | **/25** |

**Experiment No: 8**

**Title:** **Study of JFET characteristics**

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| **Aim and Objective of the Experiment:** |
| To Study FET characteristics |

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| **COs to be achieved:** |
| CO3 |

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| **Theory:** |
| The JFETs are of two types: N-channel JFET and P-channel JFET. An N-channel JFET is a N-type silicon bar with a P-type semiconductor for embedded on both sides of the bar. The P-type semiconductor forms the gate and the ends of the N-type bar are source and drain. The P-type regions are internally shorted. The gate of an N-channel JFET is connected to a negative potential wit ct h respect to source and the drain is connected to a positive potential with respeto source. Drain dynamic resistance rd : The drain resistance is defined as the ratio of change in drain to source voltage to the change in drain current, when gate to source voltage remains constant.  𝑟𝑑 = ∆VDS/ ∆𝐼𝐷 | VGS Constant  Mutual conductance gm : The mutual conductance is defined as the ratio of change in drain current to the change in gate to source voltage, when drain to source voltage remains constant.  𝑔𝑚 = ∆ID ∆𝑉𝐺𝑆 | VDS Constant  Amplification factor μ : It is defined as the ratio of change in drain to source voltage to the change in gate to source voltage, when drain current remains constant.  𝜇 = ∆VDS ∆𝑉𝐺𝑆 | ID Constant where μ, gm and rd are related to each other as μ = gm x rd .  Output Characteristics:  The output characteristics is a graph of current ID versus input voltage VDS, with constant value of (VGS). When the drain to source voltage increases drain current increases linearly. When all the charge carriers come into circulation, the current ID gets saturated.  Now, even if there is a significant change in VDS there is very little change in ID. For VGS=0, the current ID is termed as saturation current and is represented as, IDSS. The drain to source voltage after which the IDSS, gets saturated is called as pinch off voltage (Vp). The region where ID increases with increase in VDS is termed as ohmic region, and the region where in the ID gets saturated is called as saturation region (pinch off region). Transfer Characteristics: The transfer characteristics are a graph of IDS versus input voltage -VGS for a constant value of VDS. It is observed that when VGS= 0, ID = IDSS, and when ID = 0, VGS = Vp. |

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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:** |
| Output Characteristics:   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | VGS = 0V | | VGS = -1V | | VGS = -2V | | | VDS (V) | ID( uA) | VDS (V) | ID( uA) | VDS (V) | ID( uA) | | 0 | 0 | 0 | 0 | 0 | 0 | | 0.40 | 68.69 | 0.56 | 16.36 | 0.63 | 3.22 | | 3.01 | 402.34 | 3.01 | 22.90 | 4.90 | 3.23 | | 6 | 471.03 | 6 | 26.17 | 6 | 3.25 | | 12 | 526.64 | 14.22 | 29.44 | 14 | 3.27 | | 18 | 572.43 | 23.02 | 37.71 | 20 | 3.27 |   Transfer Characteristics:   |  |  |  |  | | --- | --- | --- | --- | | VDS =10V | | VDS = 20V | | | VGS (V) | ID( uA) | VGS (V) | ID( uA) | | 0 | 506.32 | 0 | 506.32 | | 0.3 | 396.23 | 0.3 | 396.23 | | 0.6 | 298.15 | 0.6 | 298.15 | | 0.9 | 214.02 | 0.9 | 214.02 | |

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| **Calculation:** |
| 1. output resistance  2. Transconductance  3. Intrinsic gain    . |

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| **Waveform** |
| Output and transfer waveforms |

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| **Post Lab Subjective/Objective type Questions: (hand written)** |
| 1. Compare JFET and BJT     2. Plot p-channel JFET characteristics using SPICE. |

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| **Conclusion: (to be written in own words)** |
| We learnt about the input output and transfer characteristics of JFET using LTSpice. |

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