Parameters of JFET

The electrical behaviour of JFET is described in terms of certain parameters called JFET parameters. The important parameters of JFET are as follows :

(1) d.c. drain resistance (R_d) :

It is also called the **static or ohmic resistance of the channel** and is given by **the ratio of drain-to-source voltage (V_{DS}) to the drain current (I_D).**

$$\therefore \quad R_d = \frac{V_{DS}}{I_D}$$

(2) a.c. drain resistance (r_d) :

It is also called the **dynamic resistance** and is the a.c. resistance between the drain and source terminal when the JFET is operating in the pinch-off or saturation region.

It is given by **the ratio of change in drain-to-source voltage (ΔV_{DS}) to the corresponding change in drain current (ΔI_D) at a constant gate-to-source voltage (V_{GS}).**

$$\therefore \quad r_d = \frac{\Delta V_{DS}}{\Delta I_D}$$

Typically, drain resistance of a JFET has a large value, ranging from 10 kΩ to 1 MΩ.

(3) Transconductance (g_m) :

It is also called the **forward transconductance** or **forward transmittance.**

It is given by **the ratio of change in drain current (ΔI_D) to the corresponding change in gate-to-source voltage (ΔV_{GS}) at a constant drain-to-source voltage (V_{DS}).**

$$\therefore \quad g_m = \frac{\Delta I_D}{\Delta V_{GS}}$$

The transconductance (g_m) is expressed in **mA/volt** or **siemens (S)** or **mhos.**

(4) Amplification factor (μ) :

It is given by **the ratio of change in drain-to-source voltage (ΔV_{DS}) to the corresponding change in gate-to-source voltage (ΔV_{GS}) at a constant drain current (I_D).**

$$\therefore \quad \mu = \frac{\Delta V_{DS}}{\Delta V_{GS}}$$

The amplification factor (μ) may also be expressed as a product of transconductance (g_m) and a.c. drain resistance (r_d).

$$\mu = \frac{\Delta V_{DS}}{\Delta V_{GS}} = \frac{\Delta V_{DS}}{\Delta I_D} \times \frac{\Delta I_D}{\Delta V_{GS}}$$

$$\therefore \quad \mu = r_d \times g_m$$