RESERVOIR ENGINEERING

1.0 BASICS OF RESERVOIR ENGINEERING:

Reservoir engineering deals with:

- Estimating hydrocarbons in place
- Predicting reservoir performance
- Maximizing recovery economically

A **reservoir** is a **porous and permeable rock** that stores and transmits fluids (oil, gas, water).

Reservoir Rock Properties

- **Porosity (ϕ)**

Fraction of void space in rock.

- **Permeability (k)**

Ability of rock to transmit fluids.

- **Density**

Mass of fluid per unit volume.

- **Specific Gravity**

Ratio of fluid density to reference fluid density (water for liquids, air for gas).

- **Viscosity**

Measure of a fluid's resistance to flow.

- **Compressibility**

Fractional change in fluid volume per unit change in pressure.

Fluid Properties (OIL-GAS-WATER)

- **Formation Volume Factor (FVF):**
  Ratio of fluid volume at reservoir conditions to its volume at surface conditions.
- **Solution Gas-Oil Ratio (Rs)**
  Volume of gas dissolved in oil per stock tank barrel at reservoir pressure and temperature.
- **Gas-Oil Ratio (GOR)**
  Ratio of produced gas volume to produced oil volume at surface conditions.
- **Oil Formation Volume Factor (Bo)**
  Ratio of oil volume at reservoir conditions to oil volume at stock tank conditions, always greater than unity.
- **Gas Formation Volume Factor (Bg)**
  Volume occupied by gas at reservoir conditions per unit volume at standard conditions.
- **Water Formation Volume Factor (Bw)**
  Ratio of water volume at reservoir conditions to its volume at surface conditions.

- **Bubble Point Pressure**
  Pressure at which gas first comes out of solution from oil.
- **Dew Point Pressure**
  Pressure at which liquid first condenses from gas.
- **Z-factor (Gas Compressibility Factor)**
  Ratio of real gas behavior to ideal gas behavior.

- **Surface Tension**
  Force per unit length acting at the interface between two immiscible fluids.
- **Interfacial Tension (IFT)**

Ratio of real gas behavior to ideal gas behavior.

- **API Gravity**
  Measure of oil density expressed relative to water.

Force per unit length acting at the interface between two immiscible fluids.

- **Interfacial Tension (IFT)**
  Surface tension between two different fluids such as oil and water.