UNIT – III

Analysis of Pumping Test Data – II

1. Unsteady Flow Towards Wells

In unsteady flow, drawdown changes with time.

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2. Theis Non-equilibrium Equation

Developed by Theis.

$$s = \frac{Q}{4\pi T} W(u)$$

Where:

- s = Drawdown
- Q = Pumping rate
- T = Transmissivity
- $W(u)$ = Well function

Theis Well Function

$$u = \frac{r^2 S}{4Tt}$$

Where:

- r = Distance from well
- S = Storage coefficient
- t = Time

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3. Assumptions of Theis Theory

- Aquifer infinite in extent
- Homogeneous and isotropic
- Confined aquifer
- Well fully penetrates aquifer
- Constant pumping rate

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4. Jacob’s Approximation

$$s = \frac{2.3Q}{4\pi T} \log\left(\frac{2.25Tt}{r^2 S}\right)$$

Applications

- Determination of transmissivity
- Estimation of storage coefficient

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5. Chow’s Method

Chow proposed graphical solutions for pumping test analysis.

Advantages

- Simple calculations
- Accurate results
- Easy graphical interpretation

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6. Leaky Aquifers

Leaky aquifers receive water through semi-pervious layers.

Characteristics

- Partial confinement
- Vertical leakage occurs
- Recharge from adjacent layers

Leakage Factor

$$B = \sqrt{\frac{Tb'}{K'}}$$ Where:

- (B) = Leakage factor
- (T) = Transmissivity
- (b') = Thickness of aquitard
- (K') = Hydraulic conductivity of aquitard

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7. Types of Wells

a) Dug Wells

Large diameter shallow wells.

b) Tube Wells

Small diameter deep wells.

c) Artesian Wells

Water rises due to pressure.

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8. Specific Capacity of Wells

$$SC = \frac{Q}{s}$$

Where:

- SC = Specific capacity
- Q = Discharge
- s = Drawdown
