EGE 5302. Hydrogeology

Unit – 1

Definitions of and differences between - Hydrology, Hydrogeology, and Groundwater hydrology. Hydrologic cycle and processes – Precipitation, Evaporation and transpiration, Runoff, infiltration. Water balance. Origin and types of waters – meteoric, juvenile, magmatic and metamorphic. Groundwater storage –Aquifer, Aquiclude, Aquifuge and Aquitard. Types of aquifers – Confined, Unconfined, Bounded aquifers, Sloping Piezometric and Phreatic aquifers. Springs.

Hydrological properties of rocks – Porosity, Permeability, Void ratio, Specific yield and Specific retention, Hydraulic conductivity, Transmissivity and Storativity. Elastcity of aquifers, barometric efficiency and barometric tidal efficiency. Geological fame work in relation to hydrogeological environment: Rock types and distribution, rock matrix, factures, weathered rocks and superficial materials.

Unit – 2

Groundwater flow - Water table and Piezometric surface - Flow characteristics of water – Head distribution, Laminar and turbulent flow. Darcy's law and its experimental verification. Flow through aquifers. Hydrological boundaries, flow nets. Groundwater tracers. Well hydraulics: Aquifer tests, organization and conduct of pumping tests, data analysis of pumping test, Recovery test, drawdown, cone of depression and cone of impression, Steady radial flow to a well in confined and unconfined aquifers – Thiem's equation and Dupuit-Forhemeir equation. Unsteady radial flow to a well in confined and unconfined aquifers – Theis equation – Theis, Chow and Cooper-Jacob methods – Isotropic non-leaky artesian aquifers.

Unit – 3

Groundwater exploration: Geological and Hydrological methods, Surface investigations of groundwater - Geophysical methods, Electrical Resistivity methods – Wenner and Schlumberger methods, Seismic refraction methods, Gravity and magnetic methods. Application of remote sensing and GIS in groundwater exploration.

Unit – 4

Water well designing - Types and mode of construction – Methods of deep well drilling-construction design – development and maintenance of wells.

Quality of Groundwater: Chemical quality- Different chemical parameters and their analysis, – Sodium Adsorption Ratio (SAR) – Water quality standard for different purposes – Drinking, Domestic, Irrigation and Industrial.

Threats to groundwater quality and reserve: Saline water intrusion in coastal and other aquifers and its prevention – Ghyben-Herzberg relationship. Artificial recharge and rain water harvesting methods.

References

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- Davis,S.N. and Dewiest, R.J.N. (1966). Hydrogeology, John Wiley and Sons Inc. New York, 463p.

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- Linsley, R.K, Kohler, M.A. and Taulhus, J.L.H. (1975) Applied Hydrology, Tata McGraw Hill, 689p.
- Todd, D.K. (1980) Groundwater Hydrology, John Wiley and Sons, 552p.
- Walton,W.C. (1970) Groundwater Resource Evaluation, McGraw Hill Inc, 664p.
- Reghunath, H.M. (1992) Groundwater. 2nd Edn.Wiley Eastern Limited, 456p.
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