Time: 3 hours   Marks: 100

Part – A   10 x 2 = 20

Answer ALL questions

1. State Darcy's law and its limitations.

2. Sate few points that can be derived form water level fluctuation data.

3. What do you mean by "Pseudo – Steady State" in pumping test analysis?

4. Define the term "Law of Times" in an image well theory.

5. State the need for groundwater balance study.

6. Distinguish between collector well and infiltration gallery.

7. Name any four chemical groundwater quality parameters.

8. What is the relationship between Total Dissolved Solids (TDS) and Electrical conductivity?

9. State any two advantages of RWH.

10. What is up-coning effect in sea water intrusion?

Part - B   5 x 16 = 80

11. (i) What is meant by aquifer? Explain the different types of aquifers with neat sketch.

(8)

(ii) How the stage of groundwater development and potential are estimated using GEC norms?   **(8)**

12. (a) (i) State Dupuit - Forcheimer assumptions and its uses in groundwater hydrology?

(4)

(ii) Derive the three dimensional groundwater flow equation for fully saturated condition.   **(12)**

(OR)

(ii The following data were collected during the pumping test of a confined aquifer to determine the aquifer parameters. The test well was pumped at the rate of 31.5 lps. The observation well is located at 15.2 m from the main pumping well. Determine T and S of an aquifer by Jacob's technique. **(16)**

Time (hrs)	0.5	1.0	2.0	4.0	6.0	12.0	24.0	48.0
Drawdown (m)	0.15	0.30	0.46	0.76	0.98	1.31	1.65	1.95

13. (a) What is the need for groundwater management models? How database management will be helpful for the groundwater management. **(16)**

(OR)

(b) (i) What is meant by conjunctive use of water? State its benefits. **(8)**

(ii) Write short note on Collector well and infiltration gallery. **(8)**

14. (a) Explain the physical, chemical and biological water quality standards for various purposes. **(16)**

(OR)

(b) A confined fresh water aquifer outflows to a sea at the rate of 0.5 $m^3/d/m$ along the length of the seacoast. The thickness and hydraulic conductivity (freshwater) of the aquifer are 20 m and 5 m/d respectively. (i) Find the depth of the interface and pezometric head 25 m away from the toe of the interface. Assume the thickness of the top impervious layer to be 5 m below msl. (ii) Compute the length of the intrusion. Given $\rho_f / (\rho_s - \rho_f) = 40$. If the water outflow is reduced to 0.35 m^2/d, compute the factor by which the interface increases. **(16)**

15. (a) (i) Explain with neat sketch about the types of artificial recharge technique. **(8)**

(ii) What is saline intrusion? List the various remediation techniques of saline intrusion. **(8)**

(OR)

(b) Why Ground water pollution and legislation is necessary in the present scenario? Narrate the various aspects of legislation should be coved for efficient ground water management. **(16)**