DEGREE	**: BE/B.Tech**
Branch	**: Civil Engineering**
Semester	**: 7**
Regulation	**: 2009**
Code No./Subject	**:PTCE9033 Ground Water Engineering**

Time : 3 Hours **Max. Marks : 100**

Answer All Questions

PART – A [10 * 2 = 20 marks]

1. Explain the terms Specific yield and specific retention of an aquifer.
2. How change in groundwater storage is estimated through GEC norms?
3. Define specific capacity of a well.
4. Explain the Principle of Law of Times
5. Why do we need modeling?
6. Explain the concept of conjunctive use.
7. How do you determine the EC of a groundwater sample?
8. If a water sample has a TDS of 1152 mg/l and EC of 1800 units, calculate the specific resistance in ohms of another water sample which has a TDS of 6400 mg/l.
9. What are the favourable conditions for natural or artificial recharge?
10. Indicate the practical methods to halt and abate seawater intrusion in the coastal environs?

PART – B [5 * 16 = 80 marks]

11. In a field test it was observed that a time of 5 hr was required for a tracer to travel from one observation well to another. The wells are 30 m apart and the difference in their water table elevations are 50 cm. Samples of the aquifer between the wells indicated a porosity of 15%. Compute
    the coefficient of permeability of the aquifer assuming it to be homogeneous;
    the actual velocity of flow as indicated by the tracer;
    the seepage velocity;
    Reynolds number for the flow assuming an average grain size of 1 mm and v_{water} at 27° C = 0.008 stoke.

(ii) Explain the Groundwater Potential theory and write the expression for velocity potential. Write a steady groundwater flow in a anisotropic formation. (8)

12a A 60 cm well is being pumped at a rate of 1360 litres per minute. At a distance of 6 m from the well being pumped, the draw down was 6m and at 15 m the draw down was 1.5 m. The bottom of the well is 90 m below the groundwater table. (a) Find out K, (b)If all the observed points were on the Dupuit's curve, what was the draw down in the well during pumping.? What is the specific capacity of the well? What is the rate at which water can be drawn from this well?

(or)

12b. Pump test data on a 60 cm well is given in table 1.The well is pumped at the rate of 900 lpm. Determine S and T. and Comment on the hydraulic boundary condition if any. Determine also the the distance between the boundary and the pumping well.

Table 1 pump test data

Time t(min)	DD in (m)				
10	3.55	250	4.35	3000	4.77
20	3.72	350	4.44	4000	4.8
30	3.82	500	4.50	5000	4.85
40	3.88	600	4.55		
50	3.95	800	4.59		
60	4.00	1000	4.62		
80	4.09	1300	4.65		
100	4.14	1600	4.69		
120	4.18	2000	4.72		
150	4.22	2500	4.75		

13a Explain model conceptualization, calibration, validation and prediction stages of simulation studies.

(or)

13b. (i) How is infiltration gallery designed and installed in a river bed? (8)
(ii) Under what circumstances can a radial collector well be advantageously used? How do you determine the length and number of laterals for proposed radial collector well? Draw a section of a collector well. (8)

14a(i) Explain Piper-trilinear diagram to represent analyses of groundwater quality with neat sketch. What are the different types of groundwater by the position of their plottings. (12)

(ii) In a titration test, 4.5 cc of silver nitrate solution was used for a sample. If 1 cc of the silver nitrate solution is equivalent to 0.001 gm of chloride ion and if 100 cc of water was used, what is the chloride content in water in mg/l. (04)

(or)

14b. Explain industrial and agricultural sources of groundwater pollution and their effects on water quality with neat flow chart.

15a(i) Explain with neat sketch. (i) Ditch and Flooding type recharge (ii) Infiltration basin recharge to ells what are the factors diminishes the natural recharge of groundwater and which are the favourable conditions for natural or artificial recharge. (10)

(ii) What aspects are to be covered in the bill of legislation to control and regulate the groundwater development? (06)

(or)

15b. By conductivity measurements in a well in a coastal aquifer extending 4 km along the shore, the interface was located at a depth of 20 m below msl at 100 m from the shore, inland. The depth of the homogeneous aquifer is 30 m below msl and has a permeability of 50 m/day. What is the rate of freshwater flow into the sea and the width of gap at the shore bottom through which it escapes into the sea? What is the position of the toe of the saltwater wedge? Use Glover's method. If due to groundwater exploitation, the freshwater flow into the sea is reduced by 80% how far the toe will eventually move?