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B.E./B.Tech DEGREE ENDSEMESTER EXAMINATIONS, NOV / DEC 2013

CIVIL ENGINEERING (FULL TIME)

VI SEMESTER (REGULATION - 2008)

CE 9033 – GROUNDWATER ENGINEERING

Time: 3 hours

Max. Marks: 100

Part – A

10 x 2 = 20 marks

Answer ALL questions

1. If the laboratory coefficient of permeability of a sample of soil is 3.2×10^{-4} lpd/m² at 200 °C, what would be the permeability value at 300° C?
2. What is meant by aquifuge and aquiclude?
3. What are the merits and demerits of partial penetration of wells?
4. State Dupuit Forchheimer assumptions.
5. Write the principle behind the transport of groundwater contamination in aquifer.
6. State the advantages of groundwater management model.
7. List the different water quality standards available in world.
8. What is up-coning effect in sea water intrusion?
9. Brief about the groundwater legislation in Tamil Nadu state.
10. Name the places where RWH structures are installed in your locality.

Part – B

(5 x 16 = 80 Marks)

11. Explain how artificial recharge techniques can be effectively used to minimise the intrusion of seawater in coastal aquifer.
- 12a.(i) Write down the step by step procedure involved in estimation of groundwater development using GEC norms. (8)
- (ii) An unconfined aquifer with a specific yield of 0.20 is used to supply water for the irrigation of farm land. The recharge area of the aquifer is same as the irrigated area. The recharge is limited to 76 mm per year. The saturated thickness of the aquifer is 15.2 m. How many years will the water supply last if 254 mm of water per year is pumped from the aquifer for irrigation? (8)

(OR)

- 12b.(i) In a homogeneous isotropic confined aquifer has a constant thickness of 20 m, effective porosity of 20% and permeability of 15m/day, two observation wells 1200 m apart indicate piezometric heads of 5.4 m and 3.0 m above MSL respectively. Assuming uniform flow, average grain diameter of sand 1 mm and kinematic

viscosity (ν) of water = $0.01 \text{ cm}^2/\text{s}$, state (a) whether Darcy's law is applicable? and (b) what is the average flow velocity in pores? (10)

(ii) Briefly explain the different types of aquifers with neat sketches (6)

13a.(i) What is meant by (a) Cone of depression (b) Radius of influence and (c) Perched aquifer. (6)

(ii) A 30 cm well completely penetrates an unconfined aquifer of saturated depth 40m. After a long period of pumping at a steady rate of 1500 lpm, the drawdown in two observation wells 25 m and 75 m from the pumping well were found to be 3.5 m and 2.0 m respectively. Determine the transmissibility of the aquifer. Find also the drawdown at the well. (10)

(OR)

13b. The time-drawdown data from an observation well in Tamil Nadu which is 12.3 m distance from a pumping well is given below. The test well is pumped at the rate of 1150 lpm. Static water level in the test well (before pumping started) is 2.18 m. determine the constants T and S by the Jacob's method.

Time 't' (min)	0	1	2	3	4	6	8	10	14	18	22	28	35	45	55	65	80	100	120
Depth of measuring point (m)	2.18	2.42	2.42	2.46	2.50	2.55	2.59	2.63	2.67	2.69	2.71	2.72	2.75	2.82	2.83	2.86	2.87	2.92	2.94

14a. Draw the schematic diagram of groundwater system indicating the inputs, state variables, policy variables and output parameters. Also discuss the aspects of groundwater modeling that are required for management of groundwater resources.

(OR)

14b. Explain with a neat sketch, the working principles of infiltration gallery and factors considered for the selection of infiltration gallery.

15a.(i) Explain the different phenomenon that occur in the movement of contaminated water (8)

(ii) Write short note on Environmental Concern. (8)

(OR)

15b.(i) Discuss the effect of tsunami in the movement of saline water intrusion. (6)

(ii) Illustrate the various graphical methods used for representing the water quality parameters (10)