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B.E / B.Tech. (Full Time) DEGREE END SEMESTER EXAMINATION, APRIL/MAY 2012

CIVIL ENGINEERING BRANCH

SIXTH SEMESTER

CE 9033 – GROUNDWATER ENGINEERING

(REGULATIONS 2008)

Time: 3 hr

Marks: 100

Answer ALL questions

Part – A (10 x 2 = 20 Marks)

1. Differentiate between apparent and actual velocity in ground water.
2. Draw equipotential lines and ground water flow lines.
3. What is pumping test?
4. Write briefly about Slug test.
5. Differentiate between Finite element method and finite difference method.
6. What do you mean by river bed infiltration?
7. What is up-coning effect in sea water intrusion?
8. State the advantages of artificial recharge?
9. Why groundwater legislation is necessary for the present scenario?
10. What is the specific resistance in ohms of a water sample having a conductivity of 3750 $\mu\text{mhos/cm}$?

Part – B (5 x 16 = 80 Marks)

11. (i) Explain water level fluctuation method adopted in Ground water estimation norms for command and non command areas. **(8)**
(ii) Two piezometers A and B, 500 m apart are driven into the same unconfined aquifer. The ground surface elevation of piezometer A is 195 m and of piezometer B is 210 m. The depths to water in A and B are 25 m and 60 m respectively. Determine the direction of groundwater flow and use the Dupuit assumptions to calculate the water table midway between the piezometers. Also calculate the quantity of seepage through a 10 m longitudinal section of the aquifer in which $K = 10^{-3}$ m/s is the horizontal base of the aquifer is at elevation 50 m. **(8)**
12. (a) (i) Derive an expression for three dimensional ground water flow. **(10)**
(ii) A well of 300 mm diameter with an aquifer thickness of 30 m has been designed for two different screen depth.; (a) A screen length of 15 m (b) A screen length of 3 m at 5 places within the aquifer depth of 30m. Determine which reduction factor for each type and suggest the best suitable one with reason. **(6)**

(OR)

- (b) (i) Explain the step by step procedure involved in the estimation of Transmissivity and storage coefficient for Theis and Jacob methods. **(8)**
(ii) Derive Thiem's equation for steady confined and unconfined Radial Flow using Darcy's law. **(8)**

13. (a) (i) Explain the step by step procedure involved in the development of density dependent groundwater management model to manage seawater Intrusion. (10)
(ii) Write the data required for the development of ground water model (6)

(OR)

- (b) (i) Explain how conjunctive use can be effectively practiced in rural environment and irrigated agriculture? and suggest suitable measures for it. (10)
(ii) Explain the method of augmenting seepage water from river banks using riverbank filtration method. (6)

14. (a) (i) Explain the classification of irrigation water (10)
(ii) Write the environmental issues related to surface and groundwater pollution (6)

(OR)

- b. (i) How does the natural and manmade environments that have an influence on the physical, chemical and biological qualities of groundwater? (10)
(ii) Explain the fresh water – seawater relation on oceanic islands. (6)

15. (a) (i) List the challenges in the implementing Rain Water Harvesting in India and discuss an effective way of implementing Rain Water Harvesting to induce Artificial Recharge. (10)
(ii) Explain the different management measures can be adopted for seawater intrusion problem. (6)

(OR)

- (b) (i) Explain ground water pollution due to agricultural sources and their causes with a flowchart. (10)
(ii) How the height of sea tide will affect the inland water? and derive an relation between the height of tide and effective distance in inland (6)