MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : CE(OE)801D Groundwater Contamination

UPID : 008333

Time Allotted : 3 Hours *Full Marks :70*

The Figures in the margin indicate full marks.
Candidate are required to give their answers in their own words as far as practicable

Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [1 x 10 = 10]

(I) Write full form of 'LNAPL'

(II) Write the process name in which water seeps into the ground.

(III) State the term that defines the continuous zig-zag movement of colloidal particles in a dispersion medium.

(IV) Define Aquiclude.

(V) Formulate the mathematical expression of 'Darcy's Law'.

(VI) State permissible limit of Total hardness (as $CaCO_3$) in drinking water as per BIS 10500:2012

(VII) Write down the sources of EDC.

(VIII) Define Dry Wells.

(IX) Interpret the highlights of National Water Policy, 2012.

(X) State the zones of vertical distribution of ground water.

(XI) State the three-dimensional transient groundwater flow equation for homogeneous and isotropic confined aquifer systems.

(XII) State acceptable limit of Lead (as Pb) in drinking water as per BIS 10500:2012.

Group-B (Short Answer Type Question)

Answer any three of the following : [5 x 3 = 15]

2. List the factors that control the occurrence and distribution of ground water in an area [5]
3. Discuss Deep wells and Shallow wells. [5]
4. Define zone of Saturation [5]
5. Discuss assumptions of Dupuit's Theory. [5]
6. Define the process of adsorption [5]

Group-C (Long Answer Type Question)

Answer any three of the following : [15 x 3 = 45]

7. (a) Define 'Radial Symmetry' of groundwater flow. [5]
   (b) Define 'Steady-State Condition' of groundwater flow. [5]
   (c) State the necessary assumptions for Steady Radial Flow in Confined Aquifers. [2]
   (d) State the assumptions for Steady Radial Flow in Unconfined Aquifers. [3]
8. (a) Define hard water and its harmful side effects due to long term exposure. [5]
   (b) Discuss the types of hardness in water. [4]
   (c) Discuss the removal process of permanent hardness from water. [6]
9. (a) The following observations were made on a 300 mm diameter well penetrating an unconfined aquifer. Rate of pumping 1800 litres/minute. Drawdown in a test well 30 m away 1.8 m. Drawdown in a test well 60 m away 0.6 m. Depth of water in the well before pumping 50 m. Determine the radius of the circle of influence. [4]
   (b) Determine the co-efficient of transmissibility of the aquifer. [4]
   (c) Discuss Limitations of Darcy's Law. [4]
   (d) Define the aims of well development. [3]
10. (a) Define Isotropy and Anisotropy of geologic formations. [3]
    (b) Define Homogeneity and Heterogeneity of geologic formations. [3]
    (c) Define the basic assumptions made for analyzing flow to wells. [5]

(d) Define Theis assumptions for the transient flow of groundwater to pumping wells tapping a confined aquifer. [4]

11. (a) Describe the legal actions that can be taken by the government to control the groundwater pollution [6]

(b) Describe the Government Plans For Groundwater Management [9]

*** END OF PAPER ***