

HYDROGEOLOGY

Time Allowed : Three Hours

Maximum Marks : 200

INSTRUCTIONS

Candidates should attempt **SIX** questions in all including Question No. 1, which is compulsory, from **PART—I** and attempt **ONE** question each from Sections A, B, C, D and E from **PART—II**.

The number of marks carried by each question is indicated at the end of the question.

Answers must be written only in **ENGLISH**.

Symbols and abbreviations are as usual.

Neat sketches may be drawn to illustrate answers, wherever required.

Wherever graphs/tables are required to be drawn, these may be plotted on the answer-book itself. No separate graph sheet is required.

PART—I

1. Attempt any *ten* of the following : $5 \times 10 = 50$

(a) Sketch *only* the conditions favouring the development of—

(i) confined water table;

(ii) perched water table.

- (b) What do you understand by capillary fringe?
- (c) What is meant by cone of depression?
- (d) Write a short note on hydraulic conductivity.
- (e) Comment on validity of Darcy's law in relation to Reynolds number.
- (f) Briefly describe groundwater modelling.
- (g) Give a schematic diagram of spontaneous potential in unconsolidated rocks.
- (h) Write a short note on major natural sources of Ca and Mg in groundwater.
- (i) Give a schematic diagram of electrical resistivity log in unconsolidated rocks.
- (j) Write a short note on tracer test.
- (k) Write a short note on perennial yield.
- (l) Write a short note on specific retention.

PART—II

Section—A

2. Elaborate in detail hydrogeological characteristics of and groundwater conditions in volcanic province, with suitable examples. 30

3. Write notes on the following : 10×3=30
- (a) Relation between specific yield and permeability
 - (b) Storativity of an aquifer
 - (c) Field characteristics affecting groundwater recharge

Section—B

4. Write notes on the following : 10×3=30
- (a) Groundwater contours and flow directions in case of unconfined aquifer
 - (b) Radius of influence and of interference with regard to wells
 - (c) Implication(s) of stable isotopes in groundwater
5. Write notes on the following : 10×3=30
- (a) Construction of flow net
 - (b) Filter pack
 - (c) Equation for groundwater balance

Section—C

6. Discuss various graphic/tabular methods of presentation of groundwater quality data. 30
7. Write notes on the following : 10×3=30
- (a) ISI quality standards for drinking water
 - (b) Quality requirements of water for paper industry
 - (c) Fluorides in groundwater

Section—D

8. Explain seismic refraction method for groundwater investigation. 30
9. Write notes on the following : 10×3=30
- (a) Electrode arrangements in (i) Wenner and (ii) Schlumberger configuration
 - (b) Natural gamma logging
 - (c) Signatures in remote sensing for groundwater investigation

Section—E

10. Enumerate the problems involved in mining operations due to groundwater. Suggest remedial measures to overcome these problems. 30
11. Write notes on the following : 10×3=30
- (a) Need for groundwater legislation
 - (b) Concept of groundwater basin management
 - (c) Advantages and disadvantages of surface reservoirs

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