भू-विज्ञान परीक्षा 2012
Geologist Examination

D–HMF–M–HFD

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 are to be drawn to illustrate answers, wherever required.

Wherever graphs/tables are required to be drawn, these may be plotted on the answer-book itself.

All parts and sub-parts of a question being attempted are to be completed before moving on to the next question.

PART—I

1. Write notes on the following in not more than *5* sentences each : 5×10=50

(a) Barometric efficiency

(b) Lamellar and turbulent flow

(c) Dupuit-Forchheimer assumptions

(d) Sodium adsorption ratio

(e) Groundwater in a sedimentary terrain

(f) Image well theory

(g) Effluent and influent streams

(h) Tides and groundwater levels

(i) Zinc in groundwater

(j) Natural pack production wells

PART—II

Section—A

2. (a) Explain the nature of unconsolidated deposits and their behaviour towards groundwater as aquifer. 15

(b) Discuss the relation between porosity, permeability and texture of rocks. 15

3. Write notes on the following : 5×6=30

(a) Specific yield and specific retention

(b) Confined and semiconfined aquifers

(c) Causes of groundwater level fluctuations

(d) Factors affecting infiltration

(e) Types of springs

(f) Flow net analysis

Section—B

4. *(a)* What is steady-state flow? Derive Thiem's equation, giving the assumptions and its application in determining the transmissivity of aquifer. 15

(b) What is well loss? Explain with equations the relation between drawdown and well loss in a pumping well. How can well loss be minimised? 15

5. Write notes on the following : 5×6=30

(a) Wetted tape and air line methods to determine water levels in a well

(b) Necessity of spacing of wells in different terrains

(c) Corrosion and inscrustation of well casing and screen

(d) Tracer technique in determining hydraulic conductivity of aquifers

(e) Specific capacity and its relation with the rate of discharge (Q) and the time since pumping started (t)

(f) Geomorphic basin and groundwater basin

Section—C

6. *(a)* State the chemical parameters determined in water quality studies. Describe the Hill-Piper diagram and its advantages and disadvantages. 15

(b) Bring out the comparison amongst different graphical representations of hydrochemical data. 15

7. Write notes on the following : 5×6=30

(a) Point sources of groundwater contamination

(b) Coastal aquifers

(c) Groundwater quality for irrigation purpose

(d) Effects of boron in groundwater

(e) US salinity laboratory diagram

(f) Radionuclides in groundwater

Section—D

8. *(a)* Give an account of the surface electrical methods of prospecting for groundwater. Explain vertical electrical sounding and profiling methods. 20

(b) With appropriate sketches, describe hydraulic and reverse rotary methods of drilling. 10

9. Write notes on the following : 6×5=30

(a) Application of elements of photo-interpretation in groundwater studies

(b) Neutron-neutron logging method

(c) Fracture trace analysis and its importance

(d) Importance of lithologic mapping in groundwater studies

(e) Seismic refraction method

Section—E

10. *(a)* Discuss the need of artificial recharge and explain different artificial recharge methods with suitable sketches. 20

(b) Discuss groundwater problems related to foundation work in urban areas. 10

11. Write notes on the following : 10×3=30

(a) Necessity of groundwater legislation and aspects to be covered by such legislation

(b) Groundwater occurrence in arid regions and management of groundwater in hard rock terrain

(c) Groundwater problems encountered in mining operations, and remedial measures

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