Combined Geo-Scientist (Main) Examination, 2021

SDT-T-HYD

HYDROGEOLOGY

*Time Allowed : **Three** Hours*	*Maximum Marks : **200***

Question Paper Specific Instructions

Please read each of the following instructions carefully before attempting questions :

*There are **NINE** questions divided under **FIVE** sections.*

*Candidate has to attempt **FIVE** questions in all.*

*The **ONLY** question in Section **A** is **compulsory**.*

*Out of the remaining **EIGHT** questions, the candidate has to attempt **FOUR**, choosing **ONE** from each of the other Sections **B, C, D** and **E**.*

The number of marks carried by a question / part is indicated against it.

Symbols, abbreviations and notations have their usual standard meanings.

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

Wherever required, graphs / tables are to be drawn on the Question-cum-Answer Booklet itself.

Attempts of questions shall be counted in sequential order. Unless struck off, attempt of a question shall be counted even if attempted partly.

Any page or portion of the page left blank in the Question-cum-Answer Booklet must be clearly struck off.

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

SECTION A
(Compulsory Section)

Q1. Write short notes on the following in not more than 5 sentences each : *5×8=40*

(a) Infiltration *5*

(b) Cavity Wells *5*

(c) Terrameter *5*

(d) Incrustation and Corrosion *5*

(e) Saline and Alkaline Soils *5*

(f) Conjunctive Use of Groundwater *5*

(g) Groundwater Budget *5*

(h) Piezometric Surface *5*

SECTION B

*Attempt any **one** question.*

Q2. (a) Give an account of the vertical distribution of groundwater. Describe the controlling factors of soil water movement in unsaturated zone. *15*

(b) What are springs ? How are they classified ? *15*

(c) Explain the laboratory method of determination of permeability. *10*

Q3. (a) Explain water table contour and flow nets. How are water table contour maps useful in the identification of flow boundaries ? *15*

(b) Describe the aquifer properties of common crustal rocks. Explain specific yield of common formation material. *15*

(c) Following data is obtained from an area. Find out the groundwater storage. *10*

Area = 1 km^2

Rainfall = 500 mm

Normal fluctuation of water table = 2·2 m

Specific yield = 2%

SECTION C

*Attempt any **one** question.*

Q4. (a) Explain the logic and principles behind pumping tests. Describe the methods of evaluating the efficacy of an open dug well. *15*

(b) Describe Bailer and Slug methods of testing the wells. *10*

(c) A 20 cm well penetrates 40 m below static water level. After a long period of pumping at a rate of 1500 lpm, the drawdown in the wells at 10 m and 25 m from the pumped well were 1·5 m and 0·5 m respectively. Determine the transmissibility of the aquifer. *15*

Q5. (a) Discuss the pros and cons of bore wells and open wells. Describe the procedure for designing a tube well drilled in multiple layers of confined aquifer. *15*

(b) Describe the various drilling equipment and their applications in diverse geological formations. *15*

(c) Describe the impact of global climate change on groundwater. *10*

SECTION D

*Attempt any **one** question.*

Q6. (a) What are the important criteria for selection of a site for sinking well (open well) of a medium to high yielding type ? *15*

(b) Explain the electrical resistivity method for locating a suitable bore well in a hard rock terrain. *10*

(c) Write notes on the following : *15*

(i) Radioactive Logging

(ii) Sonic Logging

(iii) Downhole Photography

Q7. (a) Explain the fundamentals and advancements in remote sensing techniques for groundwater exploration. *15*

(b) Briefly describe various procedures for developing a completed tube well. *15*

(c) Write notes on the following : *10*

(i) Tracer Logging

(ii) Seismic Refraction Method

SECTION E

*Attempt any **one** question.*

Q8. (a) Explain how lithology and climate affect the composition of groundwater. List down the physical and chemical parameters of potable water as per WHO standards. *15*

(b) Describe various ways of representing the chemical data of groundwater. *15*

(c) Evaluate the conditions of coastal aquifers. Explain the relationship between fresh water – salt water interface in a sedimentary sequence and alluvial sediments. *10*

Q9. (a) Briefly describe the groundwater potential in India. *15*

(b) Explain stable and unstable isotopes. Discuss the stable isotopes commonly used in groundwater studies. *10*

(c) Explain the various artificial recharge methods being followed in India. *15*