

भू-विज्ञान परीक्षा
GEOLOGIST EXAM-2017
HYDROGEOLOGY

ZLX-O-HDY

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.

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

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

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.

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

ZLX-O-HDY

SECTION A
(Compulsory Section)

- Q1. Write notes on the following in not more than 5 sentences each : 5×8=40**
- | | | |
|-----|--|---|
| (a) | Specific Yield and Specific Retention | 5 |
| (b) | Major Hydrogeomorphic Features of Arid Regions | 5 |
| (c) | Spectral Resolution in Remote Sensing | 5 |
| (d) | Principle of Resistivity Survey | 5 |
| (e) | Stable Isotopes in Hydrology | 5 |
| (f) | Ghyben-Herzberg Relationship | 5 |
| (g) | Rooftop Rainwater Harvesting | 5 |
| (h) | Application of Darcy's Law | 5 |

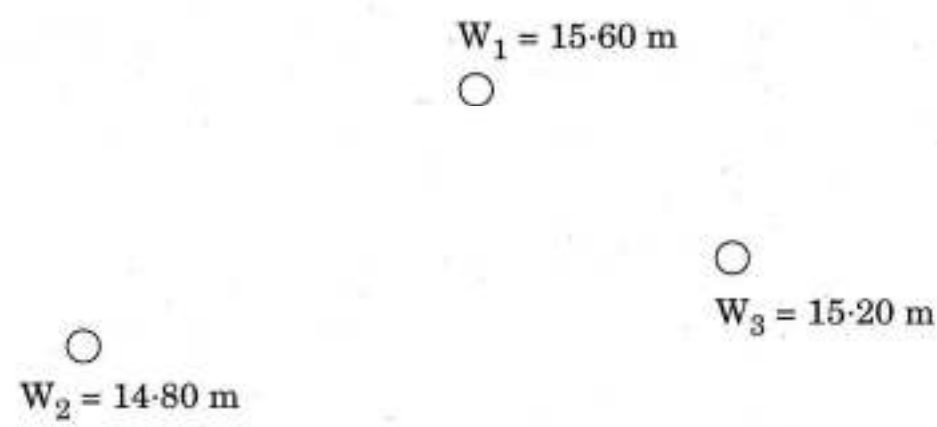
SECTION B

(Attempt any one question)

- Q2.** (a) Diagrammatically describe the occurrence of groundwater in the zone of aeration and the zone of saturation demarcating the water table. Add a note on hydrographs. 15
- (b) Schematically describe the hydrological cycle. Discuss about the water balance equation. 10
- (c) Write notes on the following : 15
- (i) Porosity and Permeability
 - (ii) Meteoric water and Magmatic water
 - (iii) Hydrostratigraphic Unit
- Q3.** (a) Define transmissivity and storage coefficient. Discuss how they are determined. 10
- (b) Differentiate between drainage basin and groundwater basin. Give an account of the major hydrogeological features of hard rock terrain in India. 15
- (c) Describe the occurrence of groundwater in the Indo-Gangetic alluvial province. 15

SECTION C

(Attempt any one question)

- Q4.** (a) (i) Distinguish between ground surface contour and water table contour. Explain how the water table contour map is prepared and state its uses. 10
- (ii) Water levels of three wells are given below. Find out the flow direction. 5
- $W_1 = 15.60 \text{ m}$

- (b) Explain the laboratory method of determining the permeability of fine grained soil. 15
- (c) During a falling head permeability test on a soil sample of 10 cm diameter and 20 cm length, the head in the stand pipe of 2 cm diameter dropped from 50 cm to 25 cm in 2 minutes. Determine the permeability of the sample. 10
- Q5.** (a) Explain the nature of the groundwater condition in shallow open wells in alluvial soil. Define critical depression head, safe working head and maximum safe yield. 15
- (b) Explain how safe yield and specific capacity of shallow open wells are determined. 15
- (c) A well 3 m dia has a normal water level of 3 m bgl. By pumping, the water level is depressed to 9 m bgl. In a time interval of 4 hours, the water level rises by 4.5 m. Determine the specific yield of the well. What is the safe yield of the well if the working depression head is 3.5 m ? 10

SECTION D
(Attempt any one question)

- Q6.** (a) Explain how the hydrogeomorphic map is prepared and how it is used in delineating groundwater potential zones. 15
- (b) Discuss the seismic refraction method of prospecting and how it is useful in groundwater exploration. 15
- (c) Discuss the different methods of interpretation of resistivity data with special reference to the curve matching technique. 10
- Q7.** (a) What are the methods of construction of tube-wells ? Describe the cable tool method of drilling tube-wells. 15
- (b) What are the well development procedures followed in completion of a well for optimum yield ? Discuss how the yield of a well is determined. 15
- (c) What are well-logging techniques and how are they useful ? 10

SECTION E
(Attempt any one question)

- Q8.** (a) Write notes on the following : 15
- (i) TDS
 - (ii) Total Hardness
 - (iii) Salt Index
 - (iv) SAR
 - (v) Sodium Percentage
- (b) Illustrate the following types of water quality plots : 15
- (i) Stiff diagram
 - (ii) Pie diagram
 - (iii) Piper trilinear diagram
- (c) Explain freshwater-saline water interface in a coastal area. Discuss the precautionary measures to control salt water intrusion in coastal areas. 10
- Q9.** (a) Discuss the problem of arsenic contamination and associated health hazards in our country. Comment on the remedial measures for controlling arsenic contamination. 15
- (b) Elaborate on the idea of conjunctive use of surface and groundwater and its benefits. 10
- (c) Write notes on the following : 15
- (i) Groundwater Legislation
 - (ii) Water-logging
 - (iii) Managed Aquifer Recharge