M. Sc. (Applied Geology) Examination, 2022

(2nd Year, 2nd Semester)

Hydrogeology

Paper – CORE/TH/12

Time : Two hours　　　　　　　　　　　　　Full Marks : 40

(Use a separate Answer script for each Part)

PART I (20 Marks)

Answer question *no. 1* and *any two* from the rest.

1. Write notes on :　　　　　　　　　　　　　2×2=4

   a) Electric Resistivity method for groundwater exploration.

   b) Groundwater Flow Nets

2. What are the common arsenic minerals and there oxidation states? What are the health hazards of arsenic exposure? What are the arsenic release mechanisms in groundwater? Mention one arsenic removal technique in groundwater.　　　　　　　　　　2+2+3+1=8

3. Write note on groundwater resource management in India. What are the common fluoride minerals? Write note on fluoride release mechanism in groundwater. What are the health hazard of fluoride exposure?

   　　　　　　　　　　　　　　　　　3+1+2+2=8

[Turn over

4. How do you estimate rainfall precipitation? Why grouting is important for construction of well? What is cone of depression? How do you differentiate it in unconfined and confined aquifers?   3+2+1+2=8

PART II (20 Marks)

Answer *any four* questions from the following :   4×5=20

5. With a relevant diagram, derive the mathematical expression to estimate in-situ coefficient permeability for an unconfined aquifer. When a confined aquifer may perform similarly like an unconfined acquifer?   4+1

6. What is 'Abstraction'? What are the related components those contribute to the volume of abstraction? Represent a schematic chart to show the different components of 'runoff processes' and interrelations in between   1+1+3

7. Why in laboratory 'falling head permeameter' is generally used to estimate the coefficient of permeability of coarse grained aquifer materials?

   A 20 cm long field sample of silt with a diameter of 8 cm is tested using falling head permeameter. The falling-head tube has a diameter of 2 cm and initial head is at 10 cm. Over a period of 8 hrs, the head in the tube falls to 2 cm. Estimate the hydraulic conductivity of the sample.   1+4

8. An unconfined aquifer consist of three horizontal layers, each individually isotropic. The top layer has a thickness of 8.4 m and a hydraulic conductivity of 11.2 m/day. The middle layer has a thickness of 6.5 m and a hydraulic conductivity of 4.8 m/day. The bottom layer has a thickness of 5.0m and hydraulic conductivity of 2.4 m/day. Compute the equivalent horizontal and vertical conductivities of the strata.   5

9. Two rivers A & B (Figure 1) are separated by an aquifer formation of 5 km length. A horizontal clay layer of 1m thickness is located at a height of 8m from the basal impervious layer, as shown in the Figure 1. Compute the discharge per unit length at River B, if the coefficient of permeability of aquifer material is 16 m/day. What will be the discharge velocity of the water through the aquifer, if the porosity of the formation is 34% what will be the seepage velocity?   5