



'समानो मन्त्रः समितिः समानी'

**UNIVERSITY OF NORTH BENGAL**

B.Sc. Honours 4th Semester Examination, 2022

**CC10-GEOLOGY**

**HYDROGEOLOGY**

Time Allotted: 2 Hours

Full Marks: 40

*The figures in the margin indicate full marks.*

1. Answer any *five* 1×5 = 5
- (a) Excessive pumping in relation to recharge can cause:
- (i) the water table to decline      (ii) a cone of depression to form  
(iii) the well to go dry      (iv) all of these
- (b) What mechanism controls the flow of water in runoff?
- (i) Gravity      (ii) Temperature  
(iii) Permeability      (iv) Porosity
- (c) People can obtain groundwater by drilling a well
- (i) above the water table      (ii) into an aquifer  
(iii) into the unsaturated zone      (iv) into an impermeable layer
- (d) An aquifer is a(n):
- (i) well in which water rises because of pressure  
(ii) underground layer of rock or sediment that holds water  
(iii) type of hot spring from which the water periodically erupts  
(iv) place where groundwater bubbles or flows out of cracks in the rock
- (e) Specific yield of a material is always
- (i) Equal to the porosity      (ii) Less than the porosity  
(iii) More than porosity      (iv) None of these
- (f) In an aquifer, the porosity varies
- (i) Vertically only      (ii) Laterally only  
(iii) Both vertically and laterally      (iv) None of these
- (g) Permeability of the material depends on
- (i) Fluidity      (ii) Hydraulic gradient  
(iii) Interconnected pores      (iv) All of these
- (h) An idealized aquifer should be
- (i) Homogeneous      (ii) Isotropic  
(iii) Homogeneous and Isotropic      (iv) Heterogeneous

2. Answer any *three* 5×3 = 15
- (a) Write about the factors that are controlling infiltration.
  - (b) Explain the role of Dykes in storage and movement of groundwater.
  - (c) “If Discharge of a well is greater than yield, then reduce the diameter of the well”. — Explain the statement.
  - (d) Which way do potentiometric lines bend (“v”) when they cross a losing stream? Illustrate your answer.
  - (e) What is permafrost and how does it affect groundwater?
3. Answer any *two* 10×2 = 20
- (a) Discuss about different methodologies of artificial recharge of ground water in an arid region. Explain hydrogeological properties of rocks that control storage and movement of groundwater. 4+6
  - (b) Discuss about the controlling factors of saline water intrusion in coastal areas. 4+6  
***“In a two layered unconfined anisotropic aquifer the horizontal hydraulic conductivity is much more than vertical one”***— Explain the statement.
  - (c) Draw a simple sketch to show the difference between an artesian well and a flowing artesian well. How would your model (predict) drawdown in a pumping well that is located near an impermeable boundary? Draw a sketch to show how multiple wells could be used to solve this problem. 4+6
  - (d) State Darcy’s law. How Darcy’s velocity is defined? Derive relation between porosity and velocity of water through pore space. Comment on the validity of Darcy’s law. 3+2+3+2

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