CBCS SCHEME

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18CV734

Seventh Semester B.E. Degree Examination, Feb./Mar. 2022
Ground Water Hydraulics

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. With a sketch, enumerate the different zones of subsurface water. **(08 Marks)**
   b. Distinguish between confined and unconfined aquifers with sketches. **(08 Marks)**
   c. Compare aquitard with aquiclude with examples. **(04 Marks)**

OR

2 a. Discuss the occurrence of water in the following:
      (i) Granite   (ii) Basalt   (iii) Gravel   (iv) Sand   (v) Clay **(10 Marks)**
   b. Highlight the salient features of the following types of aquifers (with sketches):
      (i) Perched   (ii) Leaky   (iii) Semi-unconfined **(10 Marks)**

Module-2

3 a. Explain the terms: (i) Specific yield   (ii) Storage coefficient. How they vary with the type of soil? An artesian aquifer 20 m thick has a porosity of 20% and bulk modulus of compression 10^8 N/m². Estimate the storage coefficient of the aquifer, given bulk modulus of elasticity of water as 2.1×10^9 N/m². **(08 Marks)**
   b. Define hydraulic conductivity. Discuss the factors influencing its value. How its value is determined in the field? **(06 Marks)**
   c. A field test for permeability consists in observing the time required for tracer to travel between two observation wells. A tracer was found to take 10 hours to travel between two wells 50 m apart when the difference in the water-surface elevation in them was 0.5 m. The mean particle size of the aquifer was 2 mm and the porosity of the medium 0.3. If kinematic viscosity is 0.01 cm²/sec, estimate:
      (i) The coefficient of permeability and intrinsic permeability of the aquifer
      (ii) The Reynold's number of flow **(06 Marks)**

OR

4 a. State and explain Darcy's law. Calculate the seepage velocity for the following data:
      Time taken for a tracer to move from one well to another 25.0 m apart = 5 hours
      Porosity of aquifer = 20%
      Head loss during the travel = 0.5 m **(08 Marks)**
   b. Distinguish between transmissibility coefficient and intrinsic permeability. Two aquifers were found to be connected by a water bearing stratum, which are 32 kms apart. The thickness of strata is 30 m which has an inclination of 20 m/km. The hydraulic gradient between the aquifer is 0.2 m/km. Determine the transmissibility of the stratum. It takes 20,000 years for the movement of ground water through the stratum. **(08 Marks)**
   c. When 3.68 million m³ of water was pumped out from an unconfined aquifer of 6.2 km² areal extent, water table was observed to go down by 2.6 m. Compute the specific yield of the aquifer. If the water table of this aquifer goes up by 10.8 m, compute the volume of recharge. **(04 Marks)**

Module-3

5 a. Explain the terms cone of depression and drawdown with a sketch. **(04 Marks)**

b. Deduce the discharge equation for the steady flow to a well in a confined aquifer. **(06 Marks)**

c. A pumping test was carried out on a new irrigation bore well penetrating fully into a confined aquifer at a rate of 25 litres/sec. The drawdown measured in an observation well located at 45.7 m from the pumping well during the test is tabulated below. Compute transmissibility and storage coefficient of the aquifer by Cooper-Jacob method.

Time (in hours)	0.5	1.8	2.7	5.4	9.0	12.0	18.0	30.0	54.0
Drawdown (in mt)	0.091	0.294	0.382	0.55	0.701	0.785	0.911	1.06	1.24

(10 Marks)

OR

6 a. Discuss Chow's method of computing the transmibility and storage coefficient of an aquifer. **(06 Marks)**

b. A 0.3 m well penetrates 50 m below the static water table. After a long period of pumping at a rate of 1800 liters/minute, the drawdowns in the wells at 15 m and 45 m from the pumping well were 1.7 and 0.8 m respectively. Determine the transmissibility of the aquifer. Compute also the drawdown in the pumping well. Assume radius of influence as 300 m. **(08 Marks)**

c. Highlight the salient features of image well theory. **(06 Marks)**

Module-4

7 a. Discuss the electrical resistivity method of ground water exploration. **(10 Marks)**

b. Explain temperature logging and fluid resistivity logging with the help of simple sketches. **(10 Marks)**

OR

8 a. Explain types of radioactive logging adopted in ground water exploration with simple sketches. **(10 Marks)**

b. Discuss the seismic refraction method of ground water exploration with time-travel graph. Enumerate the applications of this method. **(10 Marks)**

Module-5

9 a. Compare and contrast the use of open wells and tube wells. **(10 Marks)**

b. List the different types of pumps used to lift the water. With a neat sketch, explain working principle of a centrifugal pump. **(10 Marks)**

OR

10 a. Explain the concept of conjunctive use of water. Enumerate the benefits accruing from it. **(10 Marks)**

b. Explain (in brief) any one method of rainwater harvesting method for :
(i) individual house   (ii) multi-storeyed building. **(10 Marks)**

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