*Total number of printed pages:*03

PG/1st/PCEW1125

2021

GROUND WATER HYDROLOGY

Full Marks: 100

Time: Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. a) Define the following: 3 x 3=9

   i. Aquitard

   ii. Leaky aquifer

   iii. Connate water

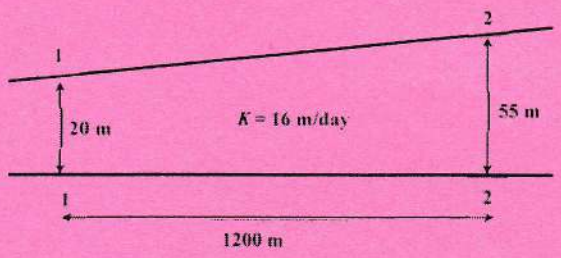
   b) Estimate the average drawdown over an area where 25 million m^3 of water has been pumped through a number of uniformly distributed wells. The area is 150 km^2 and the specific yield of the unconfined aquifer is 25%. 11

2. a) Define the following: 5x2=10

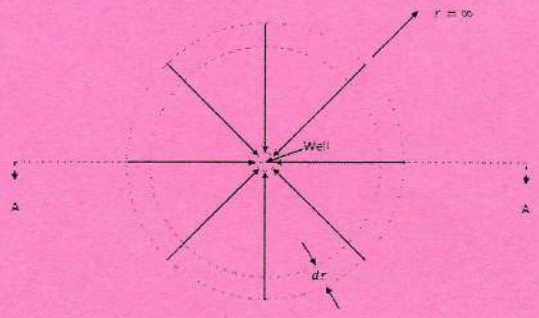
   i. Equivalent vertical hydraulic conductivity for a stratified material

   ii. Transmissivity of aquifer

   b) A confined aquifer with a horizontal bed has a varying thickness as shown in the figure. Assuming the flow in the aquifer is essentially horizontal, determine the flow rate if the piezometric heads at section 1 and 2 are 23.7 m and 27.1 m, respectively. 10



3. a) Derive the governing equation for radial flow into a well for unconfined homogeneous isotropic aquifer when flow is steady. 10



b) A well 0.5 m in diameter penetrates 33 m below the static water table. After a long period of pumping at a rate of 80 m3/hr, the drawdown in wells 18 and 45 m from the pumped well were found to be 1.8 m and 1.1 m respectively. 10

i. What is the transmissivity of the aquifer?

ii. What is the approximate drawdown in the pumped well?

iii. Determine the radius of influence of the pumping well.

4. a) Write in details about various techniques of ground water recharge. 15

   b) During January 2019, the water budget terms for Gaurang River in Kokrajhar included rainfall of 1.9 inch, evaporation of 1.5 inch, surface water inflow of 0 inch, surface outflow of 17.4 inch and change in river volume is negligible. Determine the net groundwater flow for January 2019. 5

5. a) Write in brief about probable reasons of ground water contamination. 6

   b) Derive the three dimensional advection-dispersion equation for solute transport in porous media. 14

6. Write the following: 5x4=20

   i. Time-drawdown relationships in well hydraulics for constant, discrete and variable pumping cases

   ii. Control of saline water intrusion

   iii. Advantages and disadvantages of artificial recharge

   iv. Vertical distribution of ground water