

CEL 739: Ground Water Hydrology

1st Semester 2006-07

Major Test

Max. Marks: 45

Time: 2 Hour

- Q. 1. Starting from the N – S Equations obtain Darcy's law stating all the assumptions involved therein and defining velocity potential, intrinsic permeability, and hydraulic conductivity. (5 Marks)
- Q. 2. Derive the expressions for the stagnation point and the width of flow contributing area (capture zone) of a well in a uniform flow field. (5 Marks)
- Q. 3. State the purpose of artificial recharge of groundwater. Also describe recharge mound. (4 Marks)
- Q. 4. Explain the Electric resistivity method of groundwater exploration. (2 Marks)
- Q. 5. Derive the expression for the depth of salt water interface in an oceanic island. Also, obtain expressions for amplitude in piezometric head, time lag, wavelength, and volume per cycle due to oceanic tides. (5 Marks)
- Q. 6. What do you understand by upconing? Determine the maximum permissible pumping rate from a well without mixing saline water if density of fresh water = 1000 kg/m^3 , density of saline water = 1025 kg/m^3 , hydraulic conductivity of aquifer = 0.4 m/day and depth of saline water from the well strainer prior to pumping = 10 m . (5 Marks)
- Q. 7. Why is groundwater modelling important? What should be the spacing between the plates in Hele – Shaw model for modelling ground water flow through a porous medium (hydraulic conductivity = 0.4 m/day) if the fluid used in the model has viscosity = 1.49 Pa.s and density = 1260 kg/m^3 . (4 Marks)
- Q. 8. A well (2 m diameter) in a confined aquifer (Transmissivity = $400 \text{ m}^2/\text{day}$) is pumped such that the draw down difference of 5 m is created between the well and at a radial distance of 10 m. Solve the problem by finite difference method using regular mesh as well as logarithmic mesh. Also compare these results with the exact solution. What do you infer by comparing results? (10 Marks)
- Q. 9. A confined aquifer as shown in Figure connects two reservoirs. If the upstream reservoir is polluted by a contaminant suddenly, how long will it take the contaminant to reach the downstream reservoir? Use the porosity of aquifer = 0.30. $h_0 = 20 \text{ m}$, $h_1 = 15 \text{ m}$, $b_0 = 12 \text{ m}$, $b_1 = 8 \text{ m}$ and $L = 800 \text{ m}$. (5 Marks)

