

51 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	IV / II	Time	3 hrs.

Subject: - Ground Water Engineering (Elective II) (CE76509)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.

1. a) State the advantages of groundwater in comparison to surface water. [2]
b) With the help of neat sketch briefly discuss various subsurface zones. [4]
2. a) What do you understand by the Continuum and Representative elementary Volume approach in groundwater flow analysis? Define Permeability and Transmissibility. [4+2]
b) A fully penetrating well is pumped at constant rate of $1000 \text{ m}^3/\text{hr}$ from confined aquifer of 28 m thick and average grain diameter of 1 mm. What is the domain around the well for which Darcy's law is applicable? Assume Darcy's law is valid up to Reynold's no (Re) = 6 and Kinematic viscosity of water = 1 centistokes. [8]
3. a) State the uses of water table contour. Prepare a water table contour map and show the direction of groundwater flow from four observation wells (water table elevation in wells: 51m, 56m, 76m and 66m) located at the vertex of a rectangle. Take the contour interval of 5m. [3+4]
b) Two rivers are separated by a homogeneous unconfined aquifer of 5 km long. Given the depth of aquifer at river channels as 20 m and 11 m, compute the seepage flow per unit length of the river. Coefficient of permeability, $K = 18 \text{ m/day}$. Also give the equation of phreatic line. [7]
4. a) Derive an Expression for equation of steady radial flow into a well in confined aquifer with neat sketch. [7]
b) A well with a radius of 0.5m, completely penetrates an unconfined aquifer of thickness 50 m and $K = 30 \text{ m/day}$. The well is pumped so that the water level in the well remains at 40 m above the bottom. Assuming that pumping has essentially no effect on water table at a distance of 500 m from the center of the well, compute the steady-state discharge. [4]
5. a) Why is the pumping test carried out in ground water? [2]
b) The drawdown measured in an observation well located at a distance of 100 m from a pumped well is recorded below:

t (days)	0.001	0.005	0.01	0.05	0.1	0.5	1	5	10
Drawdown(m)	0.083	0.196	0.249	0.376	0.431	0.559	0.614	0.742	0.797

The well is in confined aquifer and the uniform pumping rate from the well is $1000 \text{ m}^3/\text{day}$. Determine the aquifer parameters transmissivity (T) and storage coefficient (S) by using Cooper-Jacob method.

[8]

6. Discuss briefly the purpose of groundwater exploration. Explain with necessary sketches the Electrical Resistivity method of geophysical exploration. [2+3]
7. a) Differentiate between open well and tube well. [3]
- b) During a recuperation test conducted on an open well in a region, the water level in the well was depressed by 3m and it was observed to rise by 1.75m in 75 minutes.
- (i) What is the specific yield of open wells in that region?
- (ii) What could be the yield from a well of 5 m diameter under a depression head of 2.5 m?
- (iii) What should be the diameter of the well to give a yield of 12 lit/s under a depression head of 2 m? [2+2+3]
8. Describe in short any four common groundwater pumps. What are the factors to be considered while selecting the groundwater pump? [4+2]
9. Discuss the aquifer system of Kathmandu valley. [4]
