

BACHELOR OF CIVIL ENGINEERING 3RD YEAR EXAMINATION, 2019
(1st-Semester)

SUBJECT: Ground water Hydrology and Conservation

Time: Three hours

Full Marks 100

Use a separate Answer-Script for each part

No. of Questions	Part I (60 marks)	Marks
	Answer all the questions. Answer should be brief and to the point. Use pencil for any sketch. Assume any relevant data if not provided. Abbreviations have their usual meaning.	
Q1. a)	Define: Well rehabilitation, well loss, interference of well, open well, drawdown in the well	2×5=10
b)	With a neat labeled sketch deduce and determine the drawdown at a 305mm diameter well installed in an unconfined aquifer located at 61m from a barrier boundary after pumping at a rate of 18.9 lps leading to an unsteady state of drawdown in and around the well. The aquifer has a saturated thickness of 12.2m, a storage coefficient of 0.12 and a hydraulic conductivity of 45.7 m/day. Also draw the flow lines and equipotential lines for this case. What is 'u' and what is the assumption regarding 'u' of Jacobs' during drawdown test.	5+3+2 =10
c)	Show that for a given aquifer for unsteady state of drawdown in and around the abstraction well, the time of occurrence of equal drawdown in the different observation wells vary directly as the squares of the distances of the observation wells from the abstraction well. Explain how the well screen opening size is selected.	3+2=5
Q2.a)	Define: Point source of GW pollution, LNAPL, retardation factor, hydrodynamic control, SAR	2×5=10
b)	Write two methods for pollutants transport through ground water. Name three methods by which you can represent the chemical characteristics of ground water graphically. Write short note on reactive barrier as in-situ remediation method of ground water contamination.	2+3+5 =10
Q3.a)	As per UNEP classify different countries of the world based on the water availability and also write the respective values. Relate the concept of rain water harvesting with the water conservation. Explain how you will decide whether the harvested rainwater can be used for direct daily use or for ground water recharging.	4.5+3 +3.5=11
b)	Explain other four strategies or policies that can be adopted irrespective of rainwater harvesting for conservation of water.	4

B.E. CIVIL ENGINEERING THIRD YEAR FIRST SEMESTER EXAMINATION, 2019**GROUND WATER HYDROLOGY AND WATER CONSERVATION**

Time: Three Hours

Full Marks 100
(Part I: 60 Marks
Part II: 40 Marks)Use a separate Answer-Script for each part
Part II (40 Marks)

Question No.	(Assume reasonable values of data, if not supplied)	Marks
1	a) An artesian aquifer, 22m thick, has a porosity of 20 % and its elastic modulus of compression is 10^8 N/m ² . Estimate Storage Co-efficient of the aquifer. What fraction of this is attributable to the expansibility of water? Deduce the formula you use.	10
	b) Define 'Specific yield', Specific retention and deduce the relationship among porosity and these two parameters. Also show their relationship with grainsize graphically indicating the formula for "range of size"	10
	OR	
	a) What is Barometric Efficiency and Tidal Efficiency? Establish their relationship	6
	b) An aquifer has an average thickness of 60m and an aerial extent of 100Ha. Estimate the available ground water storage if i) the aquifer is confined and GWT fluctuation is 15m. ii) the aquifer is confined and piezometric head is lowered by 50m, which drains half the thickness of the aquifer. Assume a storage coefficient of 2×10^{-4} and specific yield of 16%.	10
c) Why does land subsidence occur due to withdrawal of ground water?	4	
2	(a) Rainfall at the rate of 10mm/hour falls on a 1.5km wide strip of land lying between two parallel canals with 3m difference in their water surface levels. It is underlain by a horizontal impermeable stratum at 10m depth below the water surface of the lower canal. Assuming a permeability of 12m/day with vertical boundaries and all the rainfall infiltrates into the soil, compute the discharge per m length of both the canals. Draw a neat sketch for illustration	12
	(b) Illustrate the phenomenon of sea water intrusion in an aquifer of fresh water with a neat sketch.	8
	OR	
	(a) Two parallel rivers A and B are separated by a landmass of 2km width. The following data are given: River A has water level 35m above a horizontal impervious bed. Difference between water surface levels of river A and river B is 20m. The permeability of the soil above horizontal impervious bed is 15m/day. Find the discharge from river A to river B per m. length of the rivers. Draw a neat sketch for illustration..	8
	(b) Deduce the expression for unconfined flow with recharge.	5
(c) What are the possible sources of saline water in a fresh water aquifer		