

BACHELOR OF CIVIL ENGINEERING 3RD YEAR EXAMINATION, 2018
(1st-Semester)

SUBJECT: Ground water Hydrology and Conservation

Full Marks 100

Time: Three hours

Use a separate Answer-Script for each part

No. of Questions	Part F (60 marks)	Marks
	<p>Question numbered 1 is compulsory and any four from the rest. Answer should be brief and to the point. Use pencil for any sketch. Assume any relevant data if not provided</p>	
Q1.	<p>Answer All the Questions Briefly in one or two sentences</p> <ol style="list-style-type: none"> i. Define well. j. To compute the drawdown in and around an abstraction well write and explain two factors that you require to consider. k. Write the two aquifer properties that are determined by the drawdown test. l. What do you mean by the term hydrodynamic control? m. What is retardation factor? n. What is ground water quality index? o. Write two important sources of salts in ground water. p. Write two mechanisms that are responsible for contaminant transport in case of ground water. q. With example classify the ground water pollution sources based on geometry. 	2×10=20
Q2.a)	Write the basic assumptions of a steadily abstracted fully penetrating bore well located in a confined aquifer and leading to an unsteady state of drawdown in and around the well.	6
b)	During the recuperation test of an open well of 4m diameter a recuperation of the depression head from 3.5m to 1.75m was found to take place in 120 minutes. Determine the specific capacity of the well per unit well area.	4
Q3.a)	Deduce the expression of drawdown of an abstraction well of 20cm radius pumped at the rate of 2000 lpm located at a distance of 150m from a recharge boundary with a neat labeled schematic diagram.	7
b)	Using that expression, determine the drawdown of the abstraction well if the transmissivity of the aquifer is $0.2 \text{ m}^2/\text{s}$.	3
Q4.a)	What do you mean by well interference? Consider four wells A, B, C and D each of 20 cm dia located at four corner points of a square having length of sides 20 m. Pumping has been starting at a rate of 2500 lpm from another well of 20cm dia which is located at the center of the square and origin of the co-ordinate system. Storage coefficient of the aquifer is 0.005. Determine the drawdown at the four wells A, B, C and D after t minutes of pumping due to the well at the center if the transmissibility of the aquifer is $0.03 \text{ m}^2/\text{s}$.	2+6
b)	What do you mean by well rehabilitation?	2

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No. of Questions	Part I (60 marks)	M
Q5.	Distinguish between DNAPL and LNAPL with proper example. Write three parameters and their importance to check the agricultural suitability of ground water.	4
Q6.	What do you mean by the term water conservation? Why it is required? What are the different strategies you can suggest for conserving our water resources?	2

B.E. CIVIL ENGINEERING THIRD YEAR FIRST SEMESTER EXAM 2018
(1st /2nd Semester/Repeat/Supplementary /Spl. Supplementary /Old/Annual/Bi-Annual)
SUBJECT: GROUND WATER HYDROLOGY AND WATER CONSERVATION

(Name in full)
PAPER xxxx

Time: ~~Two hours/ Three hours/Four hours/Six hours~~

Full Marks 30/100

Full Marks 100
 (Part I: 60 Marks
 Part II: 40 Marks)

Use a separate Answer-Script for each part

PART - II (40 Marks)

Marks

- Assume reasonable data if it is not supplied.
- Answer any two questions

- | | | |
|-----|---|----|
| 1 | a) What are formation constants of unconfined aquifers? Define them. | 6 |
| | b) Illustrate the effects of urbanization and land subsidence on fluctuation of water table | 6 |
| | c) An aquifer has an average thickness of 85m and an aerial extent of 150ha. Estimate the available ground water storage if | 8 |
| | i) The aquifer is unconfined and fluctuation of GWT is observed to be 16m. | |
| | ii) The aquifer is confined and the piezometric head is lowered by 65m, which drains half the thickness of the aquifer. | |
| | Assume a storage coefficient of 2×10^{-4} and a specific yield of 16% | |
| 1.2 | a) What are the possible sources of saline water in a fresh water aquifer? | 5 |
| | b) A canal and a stream run parallel to each other at a separation distance of 400m. Both of them completely penetrate an unconfined aquifer ($K = 3\text{m/day}$) located above a horizontal impervious bed. The aquifer forms the separation land mass between two water bodies. The water surface elevations in the canal and the stream are 5m and 3m respectively, the datum being the top of impervious layer. Estimate | 15 |
| | i) The uniform infiltration rate that will create a water table divide at a distance of 100m from the canal. | |
| | ii) The elevation of water table divide | |
| | iii) The seepage discharges into the water bodies. | |
| 1.3 | a) A confined aquifer has a thickness of 40m and a porosity of 35%. If the bulk modulus of elasticity of water and the formation material $2.2 \times 10^5 \text{ kN/m}^2$ and 7800 N/cm^2 respectively calculate storage coefficient, barometric efficiency and tidal efficiency of the aquifer. Deduce Laplace's Equation for steady flow. | 6 |
| | b) V_u and V_s are the water velocities before and after meeting the water table during percolation. Illustrate how to find V_s with the help of a neat sketch. | 6 |
| | c) Two rivers A and B are separated by a landmass by 1km and forms a confined aquifer of thickness 10m. The surface water levels in A and B are 40m and 20m respectively for rivers A and B. The permeability of the aquifer is 10m/day. Estimate the discharge from A to B. | 8 |