

U.S.N.

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E.

Semester: VII

Branch: Civil Engineering

Duration: 3 hrs.

Course Code: 22CV7PEGWH / 21CV7PEGWH

Max Marks: 100

Course: Groundwater Hydrology

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.			UNIT - I	<i>CO</i>	<i>PO</i>	Marks
	1	a)	With neat sketch, enumerate the different zones of subsurface water.	<i>1</i>	<i>1</i>	07
		b)	Distinguish between confined and unconfined aquifers with sketches.	<i>1</i>	<i>1</i>	07
		c)	Write a note on the importance of groundwater resources in India.	<i>1</i>	<i>1</i>	06
			OR			
	2	a)	Explain Darcy's Law and discuss its assumptions and limitations.	<i>1</i>	<i>1</i>	07
		b)	An artesian aquifer 20 m thick has a porosity of 20% and bulk modulus of compression 10^8 N/m^2 . Estimate the storage coefficient of the aquifer with respect to the types of soil, given bulk modulus of elasticity of water as $2.1 \times 10^9 \text{ N/m}^2$.	<i>1</i>	<i>1</i>	07
		c)	Differentiate between specific yield and storage coefficient.	<i>1</i>	<i>1</i>	06
			UNIT - II			
	3	a)	Explain Theis method to determine aquifer constants S and T for the unsteady radial flow towards a well. Also, state the assumptions involved.	<i>2</i>	<i>1</i>	10
		b)	A well that pumps at a constant rate of $0.5 \text{ m}^3/\text{s}$ fully penetrates a confined aquifer of 34 m thickness. After a long period of pumping at a steady rate, the measured drawdowns at two observation wells 50 m and 100 m from the pumping well are 0.9 m and 0.4 m, respectively. i) Calculate the hydraulic conductivity of the aquifer ii) Estimate the expected drawdown in the pumping well, if the radius of the well is 0.4 m.	<i>2</i>	<i>1</i>	10
			OR			

4	a)	Derive the discharge equation for steady radial flow into a well in a confined aquifer and list the assumptions involved.	2	1	10																														
	b)	A well penetrating a confined aquifer is pumped at a uniform rate of 2,500 m ³ /day. Drawdowns during the pumping period are measured in an observation well 60 m away; observations of t and s of the Theis equation are listed in the table below. Determine the transmissivity T and the storage coefficient S for this confined aquifer. <table border="1"><tr><td>t (min)</td><td>0</td><td>1</td><td>1.5</td><td>2</td><td>2.5</td><td>3</td><td>4</td></tr><tr><td>s (m)</td><td>0</td><td>0.2</td><td>0.27</td><td>0.30</td><td>0.34</td><td>0.37</td><td>0.41</td></tr></table> <table border="1"><tr><td>t (min)</td><td>5</td><td>6</td><td>8</td><td>10</td><td>12</td><td>14</td></tr><tr><td>s (m)</td><td>0.45</td><td>0.48</td><td>0.53</td><td>0.57</td><td>0.60</td><td>0.63</td></tr></table>	t (min)	0	1	1.5	2	2.5	3	4	s (m)	0	0.2	0.27	0.30	0.34	0.37	0.41	t (min)	5	6	8	10	12	14	s (m)	0.45	0.48	0.53	0.57	0.60	0.63	2	1	10
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		UNIT - III																																	
5	a)	Explain the process and the methods of artificial groundwater recharge with appropriate neat sketches.	2	1	10																														
	b)	Elaborate on the sources and impact of groundwater pollution.	3	1	10																														
		OR																																	
6	a)	List the main factors affecting the quality of ground water. Also, explain the concepts of advection and dispersion in analyzing the quality of groundwater.	3	1	12																														
	b)	Elaborate on groundwater salinity and the remediation methods.	3	1	08																														
		UNIT - IV																																	
7	a)	State and derive the Ghyben-Herzberg relation representing the hydrostatic equilibrium between the freshwater and saline waters.	3	1	10																														
	b)	Explain the phenomenon of salt water intrusion. Also, explain the shape and structure of fresh and saline water interface.	3	1	10																														
		OR																																	
8	a)	Elaborate on the upconing of saline water in coastal aquifers.	3	1	08																														
	b)	Explain with neat sketches, different scientific approaches to control the seawater intrusion into coastal aquifers.	3	1	12																														
		UNIT – V																																	
9	a)	Elaborate on the electrical resistivity method of groundwater exploration and state its advantages.	3	1	10																														
	b)	With neat sketches, compare the electric logging and radioactive logging methods in groundwater exploration.	3	1	10																														
		OR																																	
10	a)	Illustrate the groundwater exploration by seismic refraction method and list the challenges involved in the method.	3	1	10																														
	b)	Compare the induction logging and sonic logging methods in groundwater exploration.	3	1	10																														
