

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP/2025)**

**CLASS: BTECH
BRANCH: CIVIL**

**SEMESTER: IV
SESSION: P/2025**

SUBJECT: CE418 GROUNDWATER ENGINEERING

TIME: 02 Hours

FULL MARKS 25

INSTRUCTIONS:

1. The question paper contains 5 questions each of 5 marks total 25 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates.
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Q.1(a)	Briefly explain the vertical distribution of groundwater with the help of a neat sketch.	[2] 1	2
Q.1(b)	Differentiate between the following: i. Unconfined and confined aquifer ii. Darcy velocity and Seepage velocity	[3] 1	2
Q.2(a)	Define the following terms: (i) Permeability, (ii) Storage Coefficient.	[2] 1	1
Q.2(b)	Estimate the average drawdown over an area where 25 million m ³ of water has been pumped through several uniformly distributed wells. The area is 150 km ² and the specific yield of the unconfined aquifer is 25 percent.	[3] 1	3
Q.3(a)	State Darcy's law and its limitations.	[2] 1	2
Q.3(b)	An unconfined aquifer consists of three horizontal layers, each individually isotropic. The top layer has a thickness of 10 m and a hydraulic conductivity of 11.6 m/day. The middle layer has a thickness of 4.4 m and a hydraulic conductivity of 4.5 m/day. The bottom layer has a thickness of 6.2 m and a hydraulic conductivity of 2.2 m/day. Compute the equivalent horizontal and vertical hydraulic conductivities.	[3] 1	3
Q.4	Derive the general three-dimensional groundwater flow equation for steady-state conditions in a homogeneous & isotropic aquifer.	[5] 1	5
Q.5(a)	List the various methods of groundwater recharge.	[2] 2	1
Q.5(b)	A well fully penetrates a 25-m thick confined aquifer. After a long period of pumping at a constant rate of 0.05 m ³ /s, the drawdowns at distances of 50 and 150 m from the well were observed to be 3 and 1.2 m, respectively. Determine the hydraulic conductivity and the transmissivity.	[3] 2	3

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