

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Special Exam), Jan-Feb 2015

B. Tech in Civil Engineering, Semester V

Roll No.....

CE522 : Ground Water Hydrology

Time: 3 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1A Objective type multiple choice questions (10 questions @ 1 mark) 10

i. The lowering effect on the water table about the base of the well stem is called a(n):

- (a) aquiclude (b) artesian surface
(c) speleothem (d) cone of depression

ii. The porosity of sand sample is 50%. The specific yield of an aquifer containing this sand will be :

- (a) equal to 50 % (b) less than 50%
(c) more than 50% (d) none of the above

iii. The best groundwater reservoirs have _____.

- (a) low permeability and low porosity
(b) low permeability and high porosity
(c) high permeability and low porosity
(d) high permeability and high porosity

iv. Saturated zone and the unsaturated zone is called the _____.

- (a) porosity (b) aquiclude
(c) aquifer (d) water table

v. A stratified unconfined aquifer has three horizontal layers as below

Layer	Coefficient of permeability (m/day)	Depth (m)
1.	6	2.0
2.	16	4.0
3.	24	3.0

The effective vertical coefficient or permeability of this aquifer ,in m/day , is about

- (a)13 (b) 15
(c)24 (d)16

VI. A perched aquifer is essentially found within :

- (a) An unconfined aquifer (b) a confined aquifer
(c) an aquiclude (d) none of the above

vii.	An artesian aquifer is the one where (a) water surface under the ground is at atmospheric pressure (b) water is under pressure between two impervious strata (c) water table serves as upper surface of zone of saturation (d) none of the above	
viii.	Rate of flow of water through the ground strata, can be estimated by (a) Manning's formula (b) Striker formula (c) Darcy's formula (d) Dupuit's formula	
ix.	Discharge per unit drawdown of a well is known as the (a) specific yield (b) specific retention (c) specific capacity (d) specific storage	
x.	The dimension of coefficient of Transmissibility T are (a) L^2/T (b) L^3/T^2 (c) L/T^2 (d) dimensionless	

Q.2	Short answer type questions (4 questions @ 2.5 marks) Write a short notes on :	10
a.	State and discuss assumption and limitation of Dupuit's theory.	
b.	Explain Darcy's law. Discuss its validity.	
c.	Resistivity logging	
d.	Seismic refraction.	

Q.3A	During a recuperation test, the water in an open well was depressed by pumping by 2.5 m and it recuperated 1.8 m in 80 minutes. Find (i) Yield from the well of 4m diameter under a depression head of 3 meters. (ii) The diameter of the well to yield 8 liter/second under a depression head of 2 meters.	05
Q.3B	A gravity well has a diameter of 60 cm. the depth of water in the well is 40 meter before pumping is started. when pumping is being done at the rate of 2000 liter per minute, the drawdown in a well 10 meter away is 4 meter and in another well 20 meter away is 2 meter. Determine (a) Radius of zero drawdown (b) coefficient of permeability (c) drawdown in the well (d) specific capacity	05

Q.4A
05

From the collection and interpretation of hydrologic, geologic and geochemical data, the following information was obtained.

Width of aquifer	2.8 Km
Thickness of Aquifer	30 m
Porosity of aquifer material	10%
Difference of specific gravity	0.03
Permeability of the aquifer	48.9 m/day

From conductivity measurement in two observation wells located at 150 and 225 m from the shore (landward side) the 1500 ppm lines was found to be

	located at 15 and 22.5 m , respectively, below the top of the aquifer. Determine the fresh water- sea water interface.	
Q.4B	An aquifer of 20 m average thickness is overlain by an impermeable layer of 30 m thickness. A test well of 0.5 m diameter and two observation wells at a distance of 10 m and 60 m from the test well are drilled through the aquifer . After pumping at a rate of 0.1 m ³ /sec for a long time, the following drawdown are stabilized in these wells, first observation well, 4m; second observation well, 3m. (i)Show the arrangement in a diagram (ii) Determine the coefficient of permeability and the drawdown in the test well. (iii)state the validity of Darcy's law	05
Q.5A	Explain how the porosity can influence the hydraulic conductivity and transmissivity of an aquifer.	05
Q.5B	Write a short notes on the following : (i) Effect of earthquake on ground-water levels. (ii)Connate water and meteoric water (iii) Secular and Seasonal variation in groundwater table (iv)leaky aquifer	05
Q.6A	Derive a formula for discharge of well in a homogenous artesian aquifer, assuming equilibrium flow conditions.	05
Q.6B	An R.C. network analog has to be constructed to simulate a confined aquifer of 6 km × 4 km extent having a uniform saturated thickness of 50 m, permeability of 3 m/day , and storage coefficient of 10 ⁻³ .the aquifer may be divided into grids of 1 km × 1 km .1 sec in the analog should represent 1000 days for the aquifer . Resistor of 1 mega ohm are available and 1 m head of water should represent 1 volt in the analog .workout the scale factor for resistance and discharge. What capacitance is required for each block?	05
	OR	
Q.6B	Define ground water hydrology and explain with a neat sketch, the ground water distribution with respect to Ground.	05
Q.7A	What are sources of saline water intrusion into coastal and other aquifers? Explain the Ghyben -Herzberg relationship between saline water and freshwater.	05
Q.7B	Explain with a neat sketch, the sea water intrusion & shape of interface and what are the method used in abatement of seawater intrusion .	05
	OR	
Q.7B	Define the terms :(not more than 5 sentences) (i) Aquifer (ii) specific field (iii) specific retention (iv) porosity (v) Aquifuge	05
Q.8A	A 30 cm well completely penetrate an unconfined aquifer of depth 40 m. after a long period of pumping at a steady rate of 1500 lpm, the drawdown in two observation wells 25 m and 75 m from the pumping well were found to be 3.5 m and 2.0 m respectively. Determine the transmissibility of the aquifer .what is the drawdown at the pumping well?	10

Q.9A	Give an account of the causes for fluctuation of water levels in aquifers due to pressure changes, tides, nearness to rivers and application of load.	10
Q.9B	Two identical tube wells penetrating fully a 12 m thick aquifer are located at 180 m apart. The tube wells have diameter of 30 cm , radius of influence of 300 m, and the coefficient of permeability of aquifer is 10^{-3} m/sec. Compute (i) Discharge of tube well when only one is working with a drawdown of 5m. (ii) Percentage decrease in discharge of the well, if both are working with drawdown of 5m.	10
OR		
Q.9B	In order to determine the field permeability of a free aquifer ,pumping out test was performed and the following observation were made: 1) Diameter of well = 20 cm 2) Discharge from the well = 240 m ³ /hour 3) R.L of original water surface ,before pumping started = 240.5 m 4) R.L of water in the well at constant pumping = 235.6 m 5) R.L of the impervious layer = 210 m 6) R.L of water in observation well = 239.8 m 7) Radial distance of observation well from the tube well = 50 m Calculate i. K ii. Error in K if observation are not taken in the observation well, and radius of influence is assumed to be 300m. Actual radius of influence based on the observation of observation well.	10