(21)

B.E./B.Tech (Full Time) DEGREE END SEMESTER EXAMINATION, April/May 2011

AGRICULTURAL AND IRRIGATION ENGINEERING BRANCH
FIFTH SEMESTER – (REGULATIONS 2008)

AI 9302 – GROUNDWATER and WELL ENGINEERING

Time : 3 hr **Max. Mark : 100**

Instructions : Question Number 11 is compulsory
Provide additional semilog graph sheet

PART – A [10 * 2 = 20 marks]

1. What are the factors on which the water bearing properties of rocks depends?
2. Two sand samples have a median size of 3 mm. However, the sorting coefficient of one sample is 1.2 while that of another is 4.6. which sample is more permeable?
3. Define storage coefficient of Aquifer.
4. Determine the velocity of the groundwater flow if k= 11.0 m/day, S_y = 0.1, Piezometric contour value at up-gradient point = 164 m and Piezometric contour value at down gradient point = 152 m and the average distance between contours = 18 km.
5. Write a steady state three dimensional groundwater flow equation for a homogeneous and isotropic aquifer.
6. Explain steps followed in estimating the aquifer parameters using the Theis Method
7. The draw down is 2 m in an observation well 20 m away from the pumping well after 15 min of pumping. At what time the same draw down will occur in another well 40 m away?
8. Explain the Principle of Law of Times.
9. Explain up coning of saltwater beneath a pumped well in a coastal aquifers.
10. Write short note on groundwater prospecting.

PART – B [5 * 16 = 80 marks]

11. The time drawdown data from an observation well 12.3 m from a pumped well is given in table – 1. The test well is pumped at the rate of 1150 lpm .Static water

level in the test well is 2.18 m. Determine the constant T and S by the Jacob's method . Under what condition is this valid.

Table 1 Time drawdown data :

T (min)	0	1	2	3	4	6	8	10	14	18
Depth (m)	2.18	2.42	2.42	2.46	2.5	2.55	2.59	2.63	2.67	2.69

T (min)	22	28	35	45	55	65	80	100	120
Depth (m)	2.71	2.72	2.75	2.82	2.83	2.86	2.87	2.92	2.94

12a i) Why do we need modeling studies? Write classification of models and its application. (6)

ii) Develop an integrated methodology to identify the suitable sites for artificial recharge zones using Remote Sensing and GIS technology. (10)

(Or)

12b An Aquifer of aerial extent of 100 km^2 is overlain by four strata given below:

Strata	Thickness (m)	K_x (m/day)	K_y (m/day)
1 (top)	1	1	0.25
2	3	2	0.3
3	2	1.5	0.2
4	4	0.025	0.005

i. If a 4 hour storm occurs producing a total rainfall 100 mm, estimate the recharge into the aquifer, assuming that the piezometric surface in the aquifer is at the bottom of layer and that all layers are saturated.

ii. If the four layers are underlain by an impermeable strata instead of the aquifer, estimate the lateral flow per unit width through the layers, assuming that the layer dip by 0.1%.

13a (i) The results of sieve analysis test carried out on a 500 gm sample of underground aquifer, proposed to be tapped for installation of a tube well, are given in the table below. Design the size of the gravel pack and the slot size for the slotted screen pipes. **(10)**

Sl. No.	Size of Sieve in mm	Wt. of material retained in gm
1	> 2.54	0.0
2	1.80	6.0
3	0.30	15.0
4	0.25	320.0
5	0.21	5.0
6	0.16	50.0
7	0.12	34.0
8	< 0.12	70.0
	Total	500 gm

(ii) How the well is developed to make it sand free water and to improve its specific capacity and efficiency of the well? (6)

(Or)

13b Describe briefly the image well theory .An aquifer is bounded by two converging boundaries at an angle of 45° , one being a barrier boundary and the other a recharge boundary. Compute the number of image wells and mark them neatly in a sketch.

14a (i) Explain the Jetting method and Core drilling method with neat sketch (10)

(ii) Well Revitalization – Explain (6)

(Or)

14b (i) Explain various steps are to be followed after drilling : Well completion, Well disinfection and Well maintenance.

15a How fractures and weathering are formed in rocks? How is it influences the groundwater occurrence and movement?

(Or)

15b (i) Explain any two types of pumps used in lifting the water. (8)

(ii) Indicate the practical methods to halt and abate seawater intrusion in the coastal aquifers.