B.E./B.Tech (Full Time) DEGREE END SEMESTER EXAMINATION, April 2019
AGRICULTURAL AND IRRIGATION ENGINEERING BRANCH
FIFTH SEMESTER

AI 8502 – GROUNDWATER AND WELL ENGINEERING
(R2012)

Time : 3 hr   Max. Mark   : 100

Instructions : Question Number 11 is compulsory

PART – A [10 * 2 = 20 marks]

1. Explain briefly the three types of soil moisture associated in the zone of aeration

2. State Darcy's Law and Limitations

3. Write the Theis expression to estimate aquifer parameters.

4. Explain briefly the theory of images as applied to groundwater hydraulics.

5. What is the reason for partial screening. Indicate some good screening materials.

6. Write the advantages and disadvantages of open wells and bore wells.

7. List methods of drilling in different formations.

8. What are the factors to be considered in the selection of a suitable pumping set.

9. Explain the concept of conjunctive use of groundwater and surface water for irrigation.

10. When actually seawater intrusion takes place? How would you locate the fresh water – seawater interface?

PART – B [5 * 16 = 80 marks]
(Qn.No. 11 is compulsory)

11. 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

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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%.

12a. Write the procedure to delineate and to characterize the groundwater potential zones in the hard rock terrain using remote sensing and GIS technique with flow chart.

(or)

12b. Explain the Wenner and Schlumberger electrode arrangement with appropriate electrode connections. What are its various application to groundwater studies?

13a. The time drawdown data from an observation well of diameter 40 cm is 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 .

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		

(or)

13bi . A 25 cm well penetrates an artesian aquifer of 10 m thick. After 10 hours of pumping at the rate of 1100 lpm the drawdown in the well is 2.6 m and after 48 hours the drawdown is 2.85 m. Determine the T and S of the aquifer. What is the permeability of the aquifer material? After what time will the drawdown be 4.1 m?   (08)

ii. A 30 cm well 75 m deep is proposed in an aquifer having a transmissibility of $1.5*10^5$ lpd/m and a coefficient of storage 0.004. The static water level is expected to be 20 m below ground level. Assuming a pumping rate of 2000 lpm. What will be the drawdown in the well after one year and two years?   (08)

14a Preliminary test shows that a tubewell can yield 1800 lpm when the draw down is limited to 10 m from the aquifer situated at a depth of 90 to 110 m below ground level. The corresponding radius of the influence is estimated as 300 m. The static water level in the well is about 12 m bgl. The aquifer soil has D_{10} = 0.23 mm,D_{50} = 0.60 mm and D_{60} = 0.67 mm. Determine the diameter, length of strainer, slot size and size of the gravel pack required and also check for drawdown.

(or)

14b   Explain the hydraulic rotary method which is used for drilling the well with neat sketch. List the advantages of direct circulation and reverse circulation method.

15a   The loss of freshwater from a coastal aquifer extending 6 km along the shore has been estimated to be 30000 m^3/day. The aquifer is underlain by an impervious layer at a depth of 50 m below msl. Permeability of the aquifer is 40 m/day. Determine the i. depth of the interface below msl at 90 m from the shore inland, ii. The location of the toe of the saltwater wedge, iii. The width of the gap at the shore bottom through which the freshwater escapes into the sea and (iv) how far the toe of the wedge will move if the loss of freshwater is reduced by 80% by groundwater exploitation in the coastal aquifer?

(or)

15(b) i.What are various sources of pollution? What aspects are to be covered in the bill of legislation?   (10)
ii. Explain the artificial recharge methods that is in practice to recharge shallow aquifers.   (06)