Code No: **R42013**   **R10**   **Set No. 1**

IV B.Tech II Semester Regular/Supplementary Examinations, April- 2015
GROUND WATER DEVELOPMENT AND MANAGEMENT
(Civil Engineering)

Time: 3 hours   **Max. Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks
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1   Derive the discharge equation for steady state artesian flow along with a neat sketch and assumptions adopted.

2   A30 cm well penetrates an artesian aquifer of 12 m thick. After 12 hours of pumping at the rate of 1100 lpm the drawdown in the well is 2.9 m and after 48 hours the drawdown is 3.2 m. Determine the transmissibility and storage coefficients of the aquifer. What is the permeability of the aquifer material? After what time will the drawdown be 6 m?

3 a) Explain with the help of neat sketches, giving relevant equation :
      i) Electrical Resistivity method on the ground surface
      ii) Drilled well logging techniques (Normal Lateral and S.P. Logs)
   b) The following readings were obtained from a Terrameter while conducting a resistivity depth probe by Wenner method. Draw the resistivity curve and make interpretations for water well drilling:

Electrode spacing(m)	Resistance (ohm)
10	0.13
15	0.12
20	0.11
25	0.105
30	0.095
35	0.0925
40	0.0915
45	0.0780
50	0.0755
60	0.0735
65	0.0720
70	0.0720
75	0.0725
80	0.0705
85	0.0700

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4 a) Under what circumstances a radial collector well can be most advantageously used?

   b) From a preliminary test, it is expected that a tube well can yield 1400 lit/min under a draw own of 5 m. from a confined aquifer of 10 m thick, struck at a depth of 35 m below ground level. The static water level is 10 m below ground level. The aquifer soil has $D_{10} = 0.46$ mm, $D_{30} = 0.77$ mm, $D_{50} = 1.08$ mm, $D_{60} = 1.19$ mm. Determine the diameter, length of the strainer, slot size gradation and thickness of the gravel pack if required

5 Write short notes on installation of well screens with neat sketches
   i) Pull-back method   ii) Open- hole method.
   iii) Bail – down method   iv) Wash- down method

6 a) Give the hydrologic budget equations, separately, for the recharge area and discharge area of a basin.
   b) Explain the following recharge methods along with its design and neat sketch:
       i) Gabion Structure   ii) Spreading Basin

7 a) When actually sea water intrusion takes place? How would you locate the fresh water-sea water interface?
   b) Indicate the practical methods to halt and abate sea-water intrusion in the Andhra Coastal environs?

8 a) Explain the concept of safe yield and alternative yield

   b) Describe the role of conjunctive use in water-resources management.

Code No: **R42013**   **R10**   Set No. 2

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GROUND WATER DEVELOPMENT AND MANAGEMENT
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Time: 3 hours   **Max. Marks: 75**

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1   What type of groundwater flow is represented by the following governing equation $\frac{\partial^2 h}{\partial y^2} = \frac{S_y}{T}\frac{\partial h^2}{\partial t} - \frac{2Q}{k}$. Derive the above equation using the groundwater flow through an aquifer element.

2   The diameter of a pumping well is 10 cm, location of the observation well is 16 m and rate of pumping is 2500 lpm. Find the parameters S and T of a confined aquifer where test pumping gave the following information.
Drawdown after one hour of pumping = 3m
Drawdown after four hours of pumping = 4m.

3 a) What is reverse seismic profiling? Draw a schematic diagram to explain the determination of a sloping aquifer top.
   b) Derive expressions for cross over distance and critical distance for a three - layer formation using the seismic refraction technique.

4 a) What is the reason for partial screening? indicate some good screening materials and how you would make a choice
   b) A sample of aquifer material has the grain size distribution given in the following table. If the overlaying material is fairly firm, determine the proper slot size.

Size of sieve opening (mm)	Weight retained (gms)
1.15	55
0.82	51
0.57	87
0.40	73
0.30	46
0.20	45

5   Write short notes on   i) rotary drilling   ii) Percussion drilling
                            iii) Core drilling   iv) Rotary cum hammer drilling

6   Derive a time variant regional groundwater flow equation for confined and phreatic
     aquifers involving recharge. Discuss the various types of recharge terms that can be
     grouped together, and a method for their estimation.

7 a) Explain the Gayben – Herzberg relation between saline water and Freshwater

   b) The height of a point R on a fresh/salt water interface above the datum is 12m in a
       coastal confined aquifer of thickness 40m and hydraulic conductivity k_f= 3m/d. A
       well (A) 12.25m away from the toe bottoming at R measures a piezometric head of
       52m above the datum, whereas the head is 52 m in another well (B) located 22.25m
       from the toe. Assuming a uniform hydraulic gradient Compute the interface length L
       within the confined aquifer. Given ρ_f = 1000 kg/ m^3, ρ_s = 1025 kg/ m^3

8 a) What is overdraft? Explain how land subsidence is related to overdraft.

   b)   Write short notes on ground water development in relation to stream flow.

Code No: **R42013**   **R10**   Set No. 3

IV B.Tech II Semester Regular/Supplementary Examinations, April- 2015
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Time: 3 hours   **Max. Marks: 75**

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*****

1 a) Explain aquifer classification based upon the hydraulic conductivity of the media

   b)   Write short notes on specific storage coefficient and storativity of a confined aquifer.

2   A production well penetrating fully into a confined aquifer of thickness 9.15 m
        discharges at a rate of 1200 m3/d. An observation well is located at a discharge of 95
        m from the production well and the following time drawdown data are observed.

Drawdown(m)	35	150	202	255	305
Time (minutes)	100	180	300	500	800

        Compute the aquifer parameters T and S respectively using Jacob's drawdown
        method.

3   In a Schlumberger electrical resistivity investigation, the spacing of the current and
        potential electrodes was as follows:

Current electrode pacing(m)	5	100	500
Potential electrode spacing(m)	0.5	1.5	24

        If the amount of current passed in the ground was 628 mA and the corresponding
        voltage difference readings were 969.2, 175, and 895 milli-volts, for the respective
        spacing, compute the apparent resistivity values for the three sets. Discuss why they
        are different. What qualitative inference can you draw from it? What type of master
        curve will be used to interpret the field VES curve with the above data?

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4   The results of sieve analysis of an aquifer material are given in the following table. Determine
      i)   Effective size and uniformity coefficient of the aquifer material
      ii)   The gradation requirements of the gravel pack you recommend around the well screen.
      iii) The slot size for the well screen

Size in mm	Cumulative % finer by weight.
0.8	95
0.59	90
0.5	85
0.4	80
0.38	70
0.32	50
0.29	20
0.26	12
0.2	5

5   Write short notes on the following with neat sketches
      i) Well completion   ii) Well maintenance   iii) Well disinfection.

6   Examine the formation of mounds beneath the square, hexagonal, circular, tri-angular and rectangular recharge basins, having equal areas and equal recharge rates. Discuss the influence of lateral variation of hydraulic conductivity under a rectangular recharge basin.

7   Find an expression relating the length of the interface with freshwater out flow to the sea in a confined aquifer. Draw diagrams to show that the expression is valid when
      i) The top of a confined aquifer is at mean sea level.
      ii) The top of the confined aquifer is at a level higher than mean sea level.
      iii) The top of the confined aquifer is at a level lower than mean sea level.

8 a) Write short notes on information required for assessing development potentiality of an aquifer.
   b) Describe the various measures to be adopted for control and prevention of water logging and salinity under an irrigation regime.

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1   What are Dupit's assumptions? Derive basic governing differential equation for the
     steady one dimensional unconfined groundwater flow.

2   Two observation wells located at a distance of 495 and 575 m respectively from the
     production well measure a drawdown of 66cm and 56cm respectively after 5 hours
     of pumping at the rate of 3500 m3/day. The discharging well fully penetrates the
     confined aquifer. Compute the parameters T and S and the radius of influence of the
     well after 1 day. Assume Jacob's drawdown method is applicable.

3   Compute the depth of occurrence and thickness of the aquifer from the flowing data
     that were obtained from a seismic refraction investigation in an alluvial area. Also,
     find the depth to bed rock at the site of investigation. If a geophone is placed along
     with the shot point what will be the first arrival time recorded there. In addition,
     compute the cross over and critical distance for the seismic rays refracted from the
     bed rock.

X (m)	10	20	30	40	60	80	100	120	140	160	200
T(min)	20	40	60	80	92	105	118	130	134	139	140

4 a) Explain the criteria of design for   i) artificially gravel packed wells
                                            ii) naturally developed wells.
   b) How do you determine the length and no of laterals for a proposed radial collector
       well?

5   Write short notes on following methods of well development
  i)   Mechanical surging using compressed air
  ii) High velocity jetting of water
  iii) Over pumping and back washing.
  iv) Dispersing agents

6   Consider an artificial recharge project in India and examine its environmental impact assessment. What is your opinion about the technical feasibility and economic viability of this project impact on the environment?

7   The product of a steady discharge Q to the sea and length L of the salt/fresh water interface in confined aquifer is 114 m3/d / meter length of seacoast. The thickness of the confined aquifer is 70 m. If two observation wells, very close to each other, just before the toe region measure a hydraulic gradient of 1.67×10^{-3}, compute the height of the interface above datum 100 m away from the seacoast. ρ_f= 1000kg/m^3; ρ_s=1025kg/m^3: Draw a neat sketch

8 a) Explain various advantages of subsurface reservoirs over surface reservoirs.

   b) Explain various beneficial effects of conjunctive use in canal commands.