Code :R7420102 **1**

IV B.Tech II Semester(R07) Regular Examinations, April 2011
GROUND WATER DEVELOPMENT & MANAGEMENT
(Civil Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE questions
All questions carry equal marks

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1. Explain the following:
   (a) Ground occurrence and origin of ground water
   (b) Geological formation as aquifers and types of aquifers.
2. (a) Explain the differential equations governing ground water flow in detail.
   (b) A confined aquifer comprises materials of different hydraulic conductivities as follows: 5m of K=12m/day, 10 m of 25 m/day and 10m of 40 m/day. Determine the rate of ground water flow through a kilometer width of the aquifer under a hydraulic gradient of 1 in 300 of the piezometric surface.
3. (a) With the help of neat sketches, analyse the steady flow ground water flow towards a well in confined and unconfined aquifers.
   (b) In two observation wells located at distances of 99.9 m and 199.8 m from a pumping well discharging at a constant rate of 1.860 m and 1.570 m were recorded at the end of 7000 minutes of pumping. Determine the transmissivity of the aquifer.
4. (a) Explain unsteady flow in a confined aquifer. Hence give main features of Jacob's method for analysis of time drawdown date of pumping tests to determine aquifer parameters S and T.
   (b) What are non-equilibrium equations? Explain. Describe the assumptions if any.
5. (a) What do you know about ground water exploration? What is the objective? Also explain the factors that affect type of exploration technique.
   (b) List our various surface geophysical methods. What are the merits and demerits of each method? Under what circumstances each method is preferred to?
6. (a) Explain the concept of artificial recharge. What are the different recharge methods. What are their relative merits and demerits.
   (b) With the help of a case study, explain the use of remote sensing techniques in artificial recharge of ground water.
7. (a) Briefly explain the different methods by which saline water zones and their interfaces with associated fresh water aquifers may be delineated.
   (b) Describe the occurrence of saline water intrusions. Also explain the measures to control sea water intrusion as suggested by Todd.
8. Write short notes on:
   (a) Leak Aquifers.
   (b) Ground water management
   (c) Analysis of pumping test date.

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Code :R7420102 **2**

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Time: 3 hours **Max Marks: 80**

Answer any FIVE questions
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1. (a) Explain the role of ground water in water resources development in the country.
   (b) Define porosity, specific yield and specific retention and obtain a relation between them.
2. (a) Explain the ground water flow equation in polar co-ordinate system. What is the significance of it?
   (b) Determine the velocity of ground water flow given that
   Average k of aquifer=11.0m/day
   Effective porosity=0.10
   Piezometric contour value at up gradient point 164 m piezometric contour value at down gradient point 152 m. Average distance between contours 18 km.
3. (a) What do you understand by safe yield of a ground water basin? What are the factors influencing the safe yield? What is meant by overdraft and mining?
   (b) A well is pumped at the constant rate of 0.004 m^3/sec in a confined aquifer of transmissivity=0.004 m^2/sec and storativity =0.0005. Calculate the drawdown 24 hrs after the start of pumping in an observation well located at a distance of 250m from the pumped well.
4. (a) Describe unsteady radial flow to a well in a confined aquifer. What is thieswell function.
   (b) What do you understand by data curve, type curve and matching?
5. (a) What is the difference between electrical and seismic methods of ground water exploration? Describe seismic refraction method in detail.
   (b) Explain geophysical logging and resistivity logging.
6. (a) Explain what is artificial recharge under what circumstances artificial recharge is adopted. Also explain the factors affecting the feasibility of artificial recharge of ground water.
   (b) Describe the application of R S and GIS in artificial recharge of ground water.
7. (a) Explain Ghyben Herzberg relation in saline water intrusion in aquifer with the help of neat sketches.
   (b) Explain with a neat sketch, how segregation of saline water from fresh water is carried out by dual pumping.
8. Write short notes on:
   (a) Role of conjunctive use in water resources management
   (b) Geological formation of aquifers.
   (c) Vertical distribution of ground water.

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Code :R7420102 **3**

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(Civil Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE questions
All questions carry equal marks

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1. (a) Describe different rock properties effecting ground water.
   (b) Discuss the geological formations in India which have potential as aquifers.
2. (a) What is the nature of ground water flow? State and explain the law governing flow with limitations if any.
   (b) Explain transmissivity, hydraulic diffusivity and hydraulic resistance.
3. (a) Describe the pumping test. What information can the obtained from pumping tests?
   (b) A well of radius 30 cm fully penetrating a water table aquifer with K=20 m/day and H, initial head above the impervious stratum =40 m is pumped till a steady water level in the well is 35 m above the stratum. Assuming that R the radius of inference is 600 m and that there are no well losses, estimate the steady state discharge.
4. (a) Describe a procedure by using Jacob's method to calculate the aquifer parameters of a confined aquifer by using the well pumping test data.
   (b) Explain:
      i. Semi confined aquifer and
      ii. Jacob and Chow simplifications.
5. (a) Describe the application of aerial photogrammetry in sub-surface investigations.
   (b) Discuss electrical resistivity method with the help of a neat sketch.
6. Explain different methods of artificial recharge of ground water in brief. Also explain the merits and demerits of these methods.
7. (a) Explain the different situations to be considered in the context of saline water intrusion.
   (b) Discuss in detail the prevention and control of saline water intrusion.
8. Write short notes on:
   (a) Beneficial effects of conjunctive use in canal commands
   (b) Well tests
   (c) Ground water Hydrologic cycle.

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Code :R7420102 4

IV B.Tech II Semester(R07) Regular Examinations, April 2011
GROUND WATER DEVELOPMENT & MANAGEMENT
(Civil Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE questions
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1. Explain the following as used in ground water flow studies.
   (a) Specific yield
   (b) Specific capacity of a well
   (c) Specific retention
   (d) Zone of aeration and zone of saturation.
2. (a) Describe ground water flow contours and their applications.
   (b) An inclined cylinder of 20 cm diameter filled with saturated sand with K=10 m/day is provided with two piezometers 50 cm apart the openings of the to piezometers have elevation heads of 50 and 30 cm from a common datum and corresponding water levels in the piezometers are 32 cm and 26 cm. Estimate the flow rate through the cylinder.
3. (a) Develop the equation relating the steady state discharge from a well in an unconfined aquifer and depths of water table at two known positions from the well.State clearly all the assumptions involved in the derivation.
   (b) An unconfined aquifer has an areal extent of 15 km^2 when 9.5 million m^3 of water was pumped out, the water table was observed to go down by 2.4 m. What is the specific yield of the aquifer. If the water table of the same aquifer rises by 12.5 m during a monsoon season, what is the volume of recharge?
4. (a) What do you understand by well development. Describe briefly the various methods of well development.
   (b) Derive the basic differential equation of unsteady ground water flow in a confined aquifer. State clearly the assumptions involved.
5. (a) Explain the main objectives of the geophysical surveys as a part of ground water exploration.
   (b) Describe: i) Wenner configuration ii) Resistivity proofing and sounding.
6. (a) Explain the approaches in the assessment of recharge to ground water.
   (b) Describe spreading methods of ground water recharge.
7. Explain what is:
   (a) Zone of diffusion
   (b) Slope, shape and movement of interface as a part of saline water intrusion in aquifer.
8. Write short notes on:
   (a) Ground water resources of India and its utilization
   (b) Ground water basin management.

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