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**B.Tech. 7th Semester (Civil Engineering)**

**Examination, December-2015**

**GROUND WATER ENGINEERING**

**Paper-CE-453-F**

*Time allowed : 3 hours*

*[Maximum marks : 100]*

*Note : There are nine questions in all. Question No. 1 is compulsory and students have to attempt one question from each of the four sections.*

1. (a) Define the term aquifer. 2×10=20
- (b) List various types of strains in tubewells.
- (c) Mention any two methods of artificial recharge.
- (d) Define unsteady flow.
- (e) What do you mean by radius of influence ?
- (f) What are assumptions of Theis equation ?
- (g) A 30 cm well penetrates 50 m below the static water table. If coefficient of permeability is 10.07m/day. Determine the transmissibility of the aquifer.
- (h) What do you mean by partial penetration of an aquifer by a well ?
- (i) Why selection of pumping set important ?
- (j) In what conditions basin method of ground water recharge recommended ?

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**Section-A**

2. (a) Explain 'steady' and 'Unsteady' flow of ground water stating their circumstances. Write down the corresponding equations of such flow, giving their validity. 10
- (b) Define the following terms : 10
- (i) Specific yield
  - (ii) Transmissibility
  - (iii) Ground water exploration
  - (iv) Storage coefficient.
3. (a) With the help of neat sketch explain different types of aquifer. 10
- (b) What are different methods of ground exploration? Explain in detail. 10

**Section-B**

4. (a) What are leaky aquifers ? Explain how you would determine the formation coefficient of leaky aquifer for steady case giving the equation ? 10
- (b) What is mutual interference of a well ? How can this be avoided. 10
5. (a) Explain the effect of partial penetration on the drawdown in the well. 10
- (b) How are the barrier and recharge boundaries are identified from pump test data ? Explain with the help of neat diagrams. 10

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**Section-C**

6. (a) Describe various methods commonly used for lifting water. Explain each with neat sketch. 10
- (b) What is well development ? List its favourable effects. Describe the various methods of well development. 10
7. (a) What do you mean by tube wells ? How tubewells are classified ? 10
- (b) What are reasons for failure of tubewells ? What remedies will you suggest for increasing their life. 10

**Section-D**

8. (a) Explain induced infiltration method of ground recharge. 10
- (b) What is the purpose of designing artificial recharge projects, explain. 10
9. (a) Mention various spreading methods of artificial recharge ? Explain any two. 10
- (b) What factors lead to diminishing opportunity for natural recharge of ground water ? List favourable conditions for artificial recharge. 10

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