



Name :

Roll No. :

Invigilator's Signature :

CS/B.TECH(CE)/SEP.SUPPLE/SEM-7/CE-701/2012

2012

WATER RESOURCES ENGINEERING – II

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

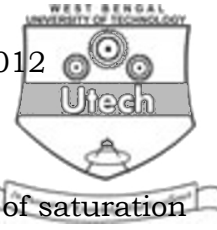
GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

10 × 1 = 10

- i) The GWT is at
 - a) atmospheric pressure
 - b) more than atmospheric pressure
 - c) less than atmospheric pressure
 - d) absolute pressure.
- ii) The most important aquifer is obtained in deposits of
 - a) sand and gravel
 - b) slit and sand
 - c) clay and sand
 - d) silt and clay.



- iii) In a soil sample, porosity depends on
- void ratio
 - degree of saturation
 - permeability
 - all of these.
- iv) If b is the aquifer thickness, then the relationship between coefficient of permeability and coefficient of transmissibility τ is given by
- $\tau = \frac{k}{b}$
 - $\tau = kb$
 - $\tau = \sqrt{bk}$
 - $\tau = \sqrt{\frac{k}{b}}$.
- v) Darcy's law is valid when the flow is
- Laminar
 - Turbulent
 - both (a) and (b)
 - none of these.
- vi) Specific retention of ground water is larger in
- coarse grained soil
 - Fine grained soil
 - both (a) and (b)
 - none of these.
- vii) Specific yield of a well is
- quantity of water available in the well
 - total quantity of water available in the well
 - flow of water per unit time
 - quantity of water per unit time per unit draw-down.



viii) Specific retention of a soil is defined as

- a) the ratio of the volume of water it will retain after saturation against the force of gravity to its own volume
 - b) the ratio of the volume of water that after saturation, can be drained by gravity to its own volume
 - c) the ratio of the volume of interstices to the total volume of the soil
 - d) the sum of porosity and specific yield.
- ix) The depression of water table in a well due to pumping will be maximum (where R is the radius influence)
- a) at a distance R from the well
 - b) at a distance $3R/4$ from the well
 - c) at a distance $R/2$ from the well
 - d) close to the well.
- x) An attracting groyne is the one which of
- a) inclined upstream b) inclined downstream
 - c) normal to the bank d) none of these.



xi) In a launching apron the total quantity of stone required for final position is initially laid in a horizontal length of

- a) 1.5 times the design depth of scour below HFL
- b) 1.5 times the design depth of scour below the floor level
- c) 2.0 times the design depth of scour below HFL
- d) 2.0 times the design depth of scour below the floor level.

xii) An aquifer confined at the bottom and not at the top is called

- a) leaky aquifer
- b) unconfined aquifer
- c) confined aquifer
- d) perched aquifer.

xiii) Discharge from a well penetrating an unconfined aquifer is given by

- a) $Q = \frac{2\pi kb(H-h)}{\log_e(R/r)}$
- b) $Q = \frac{\pi kb(H-h)}{\log_e(R/r)}$
- c) $Q = \frac{\pi k(H^2 - h^2)}{\log_e(R/r)}$
- d) $Q = \frac{2\pi k(H^2 - h^2)}{\log_e(R/r)}$.



GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. What is meant by artificial recharge of ground water ?
Enumerate the different methods which are used for this purpose.
3. Write short notes on strainer type tubewell.
4. Explain the Dupuit's equation. State the assumptions that enter in its development.
5. What is the relation between porosity, specific yield and specific retention ?
6. Name the various methods for river training & explain cut-offs & cut-off ratio with neat sketch.
7. Explain the classification of Water Resource Development Projects with their objectives.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

(Assume reasonable value of any data, if required additionally)

8. a) State the assumptions in Thiem's equilibrium equation for estimation of Q .



- b) State, when the equilibrium condition of flow is reached during pumping tests.
- c) i) Derive Dupuit's equilibrium flow relationship between Q and K .
- ii) State, in what way it differs from that of Thiem's.
- d) State various methods of groundwater recharging.

3 + 3 + 6 + 3

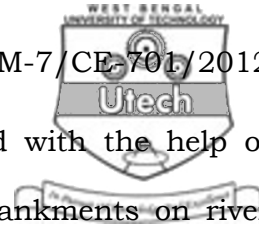
9. Enumerate the methods which are used for determining the yield of a dug well or open well. Describe briefly each of these methods. 9

The following observations were made on a 300 mm diameter well penetration on unconfined aquifer :

- a) Rate of pumping = 1800 litres/min
- b) Drawdown in a test well 30 m away = 1.8 m
- c) Drawdown in a test well 60 m away = 0.6 m
- d) Depth of water in the well before pumping = 50 m.

Determine

- i) the radius of the circle of influence
- ii) the co-efficient of transmissibility of the aquifer. 6



10. Describe briefly how a river is controlled with the help of embankments. Discuss the effect of embankments on river regime.

Describe the functions of

- a) guide banks
- b) spurs or groynes as river training measures.

What is the utility of launching aprons for guide bunds ?

6 + 6 + 3

11. a) Evaluate aquifer's parameters from Thiem's equation, jacob method and Cooper's method.
- b) Explain wells and write their types.
12. Write short notes on any *five* of the following :
- a) Artificial recharge of ground water
 - b) Confined, unconfined, perched and semiconfined aquifier
 - c) Marginal embankment
 - d) Groynes
 - e) Sea water intrusion in coastal aquifers
 - f) Recuperating test
 - g) Wells and Tubewells.

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