



Name :
Roll No. :
Invigilator's Signature :

CS/B.TECH /CE/SEM-7/CE-701/2012-13

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 the any *ten* of the following : $10 \times 1 = 10$

- i) An Unconfined aquifer is one in which
 - a) water surface under the ground is at atmospheric pressure
 - b) water is confined under pressure less than atmospheric pressure between impermeable strata
 - c) water is confined at atmospheric pressure between impermeable strata
 - d) water is confined under pressure greater than atmospheric pressure between impermeable strata.

- 7106



- vii) The repelling groynes which are largely constructed protecting from river embankments, as anti-erosion works, are
- inclined upstream
 - inclined downstream
 - normal to the bank
 - none of these.
- viii) Steady state drawdown in a confined aquifer is given by
- $S_w = \frac{Q}{2\pi T} \ln \frac{R}{r_w}$
 - $S_w = \frac{Q}{2\pi T} \ln \frac{r_1 - r_2}{r_w}$
 - $S_w = \frac{Q}{2\pi T} \ln \frac{h_2^2 - h_1^2}{r_2 / r_1}$
 - $S_w = \frac{Q}{2\pi K} \ln \left(\frac{R}{r_w} \right)^2$
- ix) A river whose bed is built up due to deposition of sediment is called a
- Degradomg river
 - Aggrading river
 - Meandering river
 - Gorge.
- x) If the culvert exit and entrance are submerged, then
- the hydraulics is the same as a pipe connecting two reservoirs
 - the structure is analysed as open channel flow
 - the headloss in the culvert includes only the minor losses
 - the analysis will not yield any result.
- xi) The Darcy is the standard unit of
- storativity
 - transmissivity
 - specific yield
 - intrinsic permeability.
- xii) River training works are seldom required in
- Rocky stage of a river
 - Boulder stage of a river
 - Trough stage of a river
 - Deltaic stage of a river.



GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following.

3 × 5 = 15

2. Name the various methods for river training and explain cut-off and cut-off ratio with neat sketch. 5
3. a) With neat sketch derive the Ghyben-Herzberg relation between Fresh & Saline water of sea for coastal aquifer. 3
b) For a coastal aquifer the height of salt water column (Z) is measured as 60m below the M.S.L. What will be the minimum safe height of fresh water column (h_f) above the M.S.L which will not cause any sea water intrusion into this aquifer ? 2
4. Explain the classification of Water Resource Development Projects with their objectives. 5
5. Describe in brief :
 - a) Zone of aeration and saturation $2\frac{1}{2}$
 - b) Confined and unconfined aquifers. $2\frac{1}{2}$
6. Distinguish between normal and maximum scour depth. 5
7. Discuss the rational method of determining high flood discharge in connection with bridge design. 5



GROUP – C
(Long Answer Type Questions)

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

8. The following data are collected from a bridge site of a river :

Max. discharge = 19000 cumec,

Highest flood level = 260.00m

River bed level = 250m.

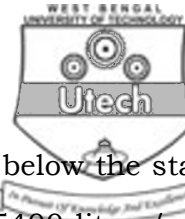
Average diameter of the river bed material = 0.10mm

Some Parameters of guide bank constructed across the bridge site of this river is also given as follows :

- i) Length of waterway (L) = 800 m
- ii) Length of upstream guide bank = 960m
- iii) Length of downstream guide bank = 200m
- iv) Upstream & downstream sweep angles are 135° & 60° respectively & radius of upstream & downstream curved head are 250m & 125m respectively.

Design the remaining portion of guide bank & sketch the guide bank including the launching apron to train the river.

9. a) Derive the formula for discharge of a well in a homogeneous unconfined aquifer assuming equilibrium flow condition. State the assumptions on which the formula is based. 8



- b) A 30 cm diameter well penetrates 25 m below the static watertable. After 24 hrs of pumping @ 5400 litres/min, the water table in an observation well at 90 m from the main well is lowered by 0.53m and in a well 30 m away from the main well, the drawdown is 1.11m. Assuming steady state condition for the unconfined aquifer, determine (i) the coefficient of transmissibility and (ii) drawdown in main well. 7

10. a) A well is located in a 25m confined aquifer of permeability 30m/day & storage co-efficient 0.005. If the well is being pumped at the rate of 1750 lit/min calculate the drawdown at a distance 100m from the well after 20hrs of pumping.

Given for the value of $u = 0.01; w(u) = 4.04$
 $u = 0.02; w(u) = 3.35$
 $u = 0.03 w(u) = 2.96$ 6

- b) An Artesian well is pumped at a constant rate of $1000\text{m}^3/\text{day}$ from an extensive aquifer of average thickness 35m. If the specific storage of the aquifer is $3 \times 10^{-4} \text{m}^{-1}$ & co-efficient of permeability is 9.5/m/day find-
- The drawdown at a point 4m from the well after 12hrs of continuous pumping.
 - The time during which the Cooper-Jacob Method (Straight line method) cannot be used. 9



11. What are guide banks ?

Design and sketch the guide bank showing the details in line diagram and sections at various locations corresponding to the following data :

Maximum discharge = 8000 cumec

Highest flood level = 105 m

River bed level = 100m

Average dia of river bed materials = 0.12mm

(Assume any other data if necessary)

3 + 12

12. Write short notes on the following :

5 × 3

- a) Different irrigation methods
- b) Aquiclude, Aquifuge, Aquitard
- c) Hydraulic Gradients and Hydraulic Conductivity
- d) Explain with neat sketch :
 - i) Perched aquifer
 - ii) Cone of depression.
- e) Field capacity and Permanent wilting point.

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