



Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/B.Tech (CE)/SEM-7/CE-701/2010-11**

**2010-11**

**WATER RESOURCE 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 :  $10 \times 1 = 10$

- i) Ground water is found to occur in the geological  
formation which is
  - a) permeability
  - b) porosity
  - c) both permeability & porosity
  - d) none of these.
- ii) Length of guide banks *u/s* and *d/s* of the work are
  - a) the same
  - b) more on *u/s* than on *d/s*
  - c) less on *u/s* than on *d/s*
  - d) as per site condition.



- iii) The depression of water table in a well due to pumping will be maximum ( where  $R$  is the radius of 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.
- iv) Specific yield of a well is
- a) quantity of water available in the well
  - b) total quantity of water available in the well
  - c) flow of water per unit time
  - d) quantity of water per unit time per unit drawdown.
- v) The most important aquifer is obtained in deposits of
- a) sand and gravel                      b) silt and sand
  - c) clay and sand                        d) silt and clay.
- vi) If  $b$  the aquifer thickness, then the relationship between co-efficient of permeability and co-efficient of transmissibility  $\tau$  is given by
- a)  $\tau = k/b$                                       b)  $\tau = kb$
  - c)  $\tau = \sqrt{bk}$                                     d)  $\tau = \sqrt{k/b}$ .
- vii) 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.
- viii) A deep tubewell may have maximum yield of
- a) 5 lits/sec                                      b) 50 lits/sec
  - c) 100 lits/sec                                  d) 200 lits/sec.



- ix) 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)  $Q = \frac{2\pi k(H^2 - h^2)}{\log_e(R/r)}$ .

- x) Levees are constructed
- parallel to the river flow
  - transverse to the river flow
  - at some inclination to river flow
  - sometime parallel and sometime transverse to river flow.
- xi) In a meandering river the deepest part of the river in reach is found at
- the outer bank near the apex of the curve
  - the crossing
  - the mid-point in a cross-section
  - the inner bank of the curve.
- xii) A super pointing upstream form a still pocket against its upstream face
- repelling the flow from the bank
  - attracting, the flow towards the bank
  - deflecting the flow at the site.



- xiii) When a river departs from its straight course and follows a sinuous path the river is said to form meanders. The main causes for this occurrence are
- a) the river wants to travel larger length
  - b) the river carries heavy silt load
  - c) the equilibrium condition of river flow is distributed to induce unequal erosion
  - d) the river valley is full of rocky structure.
- xiv) Guide banks converging in the downstream direction is called
- a) divergent guide banks
  - b) parallel guide banks
  - c) convergent guide banks.

**GROUP – B**

**( Short Answer Type Questions )**

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

2. During a recuperation test of an open well, the water level was depressed by pumping 4 metres and pumping was stopped. The recuperation was observed to be 1 m in 4 hr. Determine the field from the well if the diameter of the well is 3 m and the drawdown is 2.5 m.
3. Explain Darcy's law for determining groundwater velocity.
4. Explain strainer type tubewell.
5. What is Groynes or spurs ? Explain with figures.
6. Write difference between bridges and culverts. Define waterway, alignment, scour depth, afflux.
7. Write short notes on the purpose of water resources of development.



**GROUP – C**

**( Long Answer Type Questions )**

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

8. a) What are the functional requirements of a water resources development project. 10
- b) Write in brief about artificial cut-off. 5
9. Write short notes on any *three* of the following :  $3 \times 5$
- a) Aggrading and degrading rivers
- b) Groynes, their type and uses
- c) Pitching of Banks and Pitched Islands as the means of training rivers
- d) Importance of rivers and necessity of controlling them.
10. a) Distinguish with sketches if necessary, the difference between confined and unconfined aquifer, assuming equilibrium flow conditions. State the assumptions on which the formula is based.
- b) A tubewell penetrates fully in a 8.5 m thick water bearing stratum. The co-efficient of permeability of the stratum is 0.006 m/s. The diameter of the tubewell is 30 cm and it is to be worked under a drawdown of 5.5 m at the well face. Determine the well discharge. If the radius of the well is increased to 20 cm, what will be the increase in its discharged ? Assume the radius of the drawdown as 250 m.



c) During a recuperation test, the water in an open well was depressed, by pumping by 2.5 m. The well recuperated 1.5 m in 80 min. Determine

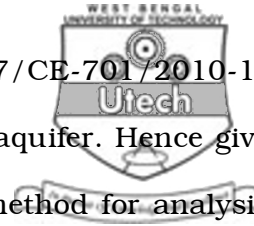
- i) yield from a well of 3 m diameter under a depression head of 2.5 m
- ii) the diameter of the well for yielding 10 lits/sec. under a depression head of 1.8 m. 15

11. a) A gravity well has a diameter of 60 cm. The depth of water in the well is 40 m before pumping is started, when pumping is being done at the rate of 2000 lits/min the drawdown in a well 10 m away is 4 m and another well 20 m away in 2 m. Determine

- i) radius of zero drawdown
- ii) co-efficient of permeability
- iii) drawdown in the well
- iv) specific capacity of the well
- v) maximum rate at which water can be pumped from the well. 12

b) Explain :

- i) Specific retention of a soil
- ii) Specific yield of an aquifer. 3



12. a) Explain unsteady flow in a confined aquifer. Hence give main features of Jacob's & Cooper method for analysis of time drawdown data of pumping tests to determine aquifer parameters S & T.

b) A well is located in an aquifer with hydraulic conductivity 15 m/day and storage activity 0.005. The aquifer is 20 m thick and is pumped at a rate of 2725 m<sup>3</sup>/day. What is the drawdown at a distance of 7 m from the well after one day of pumping ? Given data :

$$u = 1 \times 10^{-3} = w(u) 6.33$$

$$u = 2 \times 10^{-3} = w(u) 5.64$$

$$u = 2 \times 10^{-4} = w(u) 7.94$$

15

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