Name : ....

Roll No. : ....

Invigilator's Signature : ....

CS/B.TECH(CE)/SEM-7/CE 701 /2011-12

2011
WATER RESOURCES ENGINEERING-II

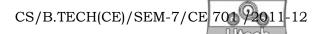*Time Allotted* : 3 Hours   *Full Marks* : 70

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 :

              $10 \times 1 = 10$

    i)   The zone of aeration in a ground profile consists of

         a)   capillary fringe   b)   soil water zone

         c)   intermediate zone   d)   all of these.

    ii)   Darcy's law of ground water velocity is valid when the flow is

         a)   laminar   b)   turbulent

         c)   both (a) and (b)   d)   none of these.

    iii)   The line joining the static water levels in several wells, excavated through a confined aquifer, is known as

         a)   cone of depression   b)   piezometric surface

         c)   perched water table   d)   hypsometric curve.

7106   [Turn over

iv) A confined 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.

v) The ratio of the length along the channel to the direct axial length of a meandering river reach is called

    a) meander ratio   b) crossing

    c) tortuosity   d) none of these.

vi) A levee is used for

    a) flood protection

    b) providing sufficient water depth in navigable channel

    c) disposal of suspended and bed load

    d) all of these.

vii) The scour depth measured from the HFL of a river is greater in a

    a)   bouldery river   b)   alluvial river

    c)   same in both cases   d)   none of these.

viii) On a meandering river, the current is strongest on

    a)   concave bend   b)   convex bend

    c)   same in both banks   d)   middle of the river.

ix) Permeable spurs are used to

    a)   promote siltation along the banks of the river

    b)   deflect the flow

    c)   attract the flow

    d)   contract the width of the river for navigation purposes.

x) The Lacey's regime width of the stream is given by

    a) $W = 4 \cdot 75 Q$ b) $W = 4 \cdot 75 \sqrt{Q}$

    c) $W = 4 \cdot 75\, Q^{2/3}$ d)   None of these.

xi) River training works serve the purpose of

    a)   increasing or decreasing the river discharge

    b)   protecting the river bed and banks from erosion

    c)   directing the river flow in desired direction

    d)   protecting the important hydraulic structures

    e)   protecting the surrounding land from flooding.

    xii) Deep tubewells in hard boulder-alluviums, can be best drilled by

        a)   Rotary drilling rigs

        b)   Percussion drilling rigs

        c)   Down the hole hammer (DTH) rigs
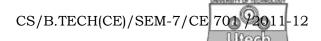
        d)   None of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following.   3 × 5 = 15

2.   Discuss the rational method of determining high flood discharge in connection with bridge design.

3.   What are confined and unconfined aquifers ? What are perched aquifers and aquicludes ?

4.   What are permeability and transmissivity ? State how they are related.

5.   Draw sketches for

        a)   gravity springs

        b)   surface springs

        c)   artesian springs.

6. Write down the steps involved in planning of water resource development project.

7. Define specific yield and specific retention. What is their relation with porosity ? 2 + 2 + 1

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

8. 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 cumecs

Highest flood level = 105·00 m

River bed level = 100·00 m

Average dia of river bed materials = 0·12 mm

(Assume any other data if necessary) 3 + 12

9. What are groynes ? What are their types ? Distinguish between repelling groynes and reflecting groynes. How are they located on concave and convex banks ? How are length and spacing of groynes determined ? 2 + 2 + 4 + 7

10. Write short notes on any three of the following :   3 × 5

    a)   Afflux at bridges

    b)   Waterway calculation for bridges

    c)   Waterway and scour depth provision in bridge design

    d)   Economical span length for bridge

    e)   Provision of causeway in road condition.

11. a)   Find out the velocities of ground water flow with the following data, using Slichter & Hazen's constant as 400 & 800 respectively :   5

          Viscosity of ground water at $10°C$ is 1gm/cm. sec, Effective size of the aquifer material = 0·1 mm, Hydraulic gradient = 1 in 80

    b)   A 30 cm diameter well penetrates 25 m below the static water table. After 24 hours of pumping @5400 lits/min, the water level in a test well at 90 m away is lowered by 0·53 m & in a well 30 m away the drawdown is 1·11 m.

         i)   What is the transmissibility of the aquifer ?

         ii)   Determine the drawdown in the main well.   10

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

Max. discharge = 17000 cumec

Highest flood level = 288·00 m

River bed level = 280 m.

Average diameter of the river bed material = 0·10 mm

Some parameters of guide bank constructed across the bridge site of this river are also given below :

i)   Length of waterway (L) = 756 m

ii) Length of upstream guide bank = 945 m

iii) Length of downstream guide bank = 189 m

iv) Upstream & downstream sweep angles are 135° & 60° respectively & radii of upstream & downstream curved heads are 250 m & 125 m respectively.

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