

(Following Paper ID and Roll No. to be filled in your Answer Book)

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**B.Tech.**

(SEM. VII) ODD SEMESTER THEORY EXAMINATION 2012-13  
**WATER RESOURCES ENGINEERING**

Time : 3 Hours

Total Marks : 100

**Note :** (i) Attempt all questions.

(ii) Each question carries equal marks.

(iii) Use any missing data suitably.

1. Attempt any **four** parts of the following : **(5×4=20)**
- (a) Explain with the help of a diagram the concept of hydrologic cycle. What are the different components of hydrologic system ? Describe in brief with suitable examples.
  - (b) What do you understand by precipitation ? Explain various types of precipitation.
  - (c) Describe various methods of computing average rainfall over a basin. How will you ascertain the missing rain-gauge data ?
  - (d) Describe the salient features of probabilistic maximum precipitation curves.
  - (e) What do you understand by consumptive use of water ? What are the factors affecting consumptive use of water ?
  - (f) Explain the process of infiltration. How the run-off is estimated by infiltration method ? Explain the infiltration indices.

2. Attempt any **two** parts of the following : (10×2=20)

(a) What is the concept of Unit Hydrograph ? Explain the various assumptions involved in the theory of unit hydrograph.

In the following table the rainfall data at every 2-hours interval are given. Construct the ordinate of unit Hydrograph. Assume the area of the basin = 25 km<sup>2</sup>.

|                                |     |     |    |    |    |    |    |    |
|--------------------------------|-----|-----|----|----|----|----|----|----|
| <b>Hour</b>                    | 00  | 02  | 04 | 06 | 08 | 10 | 12 | 14 |
| <b>Total Discharge (Cumec)</b> | 6   | 8   | 10 | 16 | 28 | 42 | 60 | 80 |
| <b>Hour</b>                    | 16  | 18  | 20 | 22 | 24 | 26 | 28 | 30 |
| <b>Total Discharge (Cumec)</b> | 110 | 100 | 90 | 80 | 68 | 56 | 45 | 35 |
| <b>Hour</b>                    | 32  | 34  | 36 | 38 | 40 | 42 | 44 |    |
| <b>Total Discharge (Cumec)</b> | 26  | 18  | 11 | 9  | 8  | 7  | 6  |    |

(b) The Hourly distribution of a 2-hour Unit Hydrograph are given below. Derive a 6-hours Unit hydrograph ordinates.

|                          |     |     |     |     |     |     |     |     |     |
|--------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| <b>Time (Hours)</b>      | 0   | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   |
| <b>Discharge (Cumec)</b> | 0   | 1.0 | 2.7 | 5.0 | 8.0 | 9.8 | 9.0 | 7.5 | 6.3 |
| <b>Time (Hours)</b>      | 9   | 10  | 11  | 12  | 13  | 14  | 15  |     |     |
| <b>Discharge (Cumec)</b> | 5.0 | 4.0 | 2.9 | 2.1 | 1.3 | 0.5 | 0   |     |     |

(c) What do you understand by crop-rotation ? What are its advantages ?

A field channel has CCA of 2000 ha. The intensity of irrigation for gram is 30% and for wheat is 50%. Gram has kor-period of 18 days and kor-depth of 12 cm, while wheat has a kor period of 15 days and a kor-depth of 15 cm. Calculate the discharge of the field channel.

3. Attempt any **two** parts of the following : (10×2=20)

- (a) Design an irrigation channel in alluvial soil according to Lacey's silt theory, with the given following data :

Full supply discharge : 1.5 cumecs

Lacey's silt factor : 1.0

Channel side slope :  $\frac{1}{2} : 1$

- (b) Describe the main features of the cross-section of an irrigation channel with suitable sketches.
- (c) What is the problem of water logging ? What are the poor effects of water logging ? Describe some suitable remedial measures against water logging in brief.

4. Attempt any **two** parts of the following : (10×2=20)

- (a) What are the different types of canal regulation works constructed for efficient working and safety of an irrigation channel ? Describe in brief with suitable sketches.

- (b) What is an outlet ? Write down the requirements that an outlet should fulfil. Distinguish clearly between non-modular and semi-modular outlets with suitable examples.

- (c) What do you mean by river training ? Give the classification of various types of river-training work. What do you mean by high water training, low water training and medium water training ?

5. Attempt any **four** parts of the following : (5×4=20)

- (a) Describe various zones of under-ground water. Explain the terms : aquifer, aquiclude, and aquifuge.

- (b) An artesian tube-well has a diameter of 20 cm. The thickness of aquifer is 30 cm and its permeability is 38 m/day. Find its yield under a draw-down of 4 m at the well face. Use radius of influence as recommended by Sichardt.
- (c) Explain the method of determining the coefficient of transmissibility of a confined aquifer by pumping out test. How can this method be extended for unconfined aquifer?
- (d) Distinguish clearly between a shallow well and a deep well. How does a deep well differ from a tube-well in a confined aquifer?
- (e) Two tube-wells, each of 20 cm diameter are spaced at 100 m distance. Both the wells penetrate fully a confined aquifer of 12 m thickness. Calculate the discharge if only one-well is discharging under a depression head of 3 m. What will be the percentage of decrease in the discharge of the well if both the wells are discharging under the depression head of 3 m. Take radius of influence for each well equal to 250 m and coefficient of permeability of aquifer as 50 m/day.
- (f) Describe in brief the advantages and disadvantages of well irrigation over canal irrigation.