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# B.TECH.
## (SEM-VII) THEORY EXAMINATION 2021-22
## WATER RESOURCES ENGINEERING

*Time: 3 Hours*                                    *Total Marks: 100*

**Note: 1.** Attempt all Sections. If require any missing data; then choose suitably.

### SECTION A

**1.    Attempt *all* questions in brief.                    2 x 10 = 20**

   a.    What is consumptive use of water?
   b.    Differentiate between initial and final regime according to Lacey's theory?
   c.    What do you mean by meandering of rivers?
   d.    What is high water training?
   e.    List the difference between super passage and canal siphon?
   f.    Explain "Pheratic line" in terms of earthen dams?
   g.    Write the use of energy dissipaters?
   h.    Draw a neat sketch of siphon spillway with nomenclature.
   i.    How failure of hydraulic structure founded on permeable foundations, occurs.
   j.    Classify rivers on the basis of topography of river basin.

### SECTION B

**2.    Attempt any *three* of the following:                    10 x 3 = 30**

   a.    A stream of 130 1itres per second was diverted from a canal and 100 liters per second were delivered to the field. An area of 1.6 hectares was irrigated in 8 hours. The effective depth of root zone was 1.7 m. The runoff loss in the field was 420 $m^3$. The depth of water penetration varied linearly from 1.7 m at the head end of the field to 1.1 m at the tail end. Available moisture holding capacity of the soil is 20 cm per meter depth of soil. It is required to determine the water conveyance efficiency, water application efficiency, water storage efficiency, and water distribution efficiency. Irrigation was started at a moisture extraction level of 50% of the available moisture.

   b.    Design an irrigation channel to carry 50 $m^3$/sec of discharge. The channel is to be laid at a slope of 1 in 4000. The critical velocity ratio for the soil is 1.1. Use Kutter's rugosity coefficient as 0.023.

   c.    What do you mean by Guide banks? Briefly discuss its working and draw its cross sectional and plan view.

   d.    How to calculate the storage of reservoir using flow mass curve technique. Explain with the help of an appropriate example.

   e.    What is seepage analysis in earthen dams? Derive an equation of seepage discharge through isotropic soils.

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## SECTION C

**3.** **Attempt any *one* part of the following:** **10 x 1 = 10**

(a) What is delta and duty? Find the delta of the crop when its duty is 1256 ha/cumecs on the field, the base period of the crop is 93 days.

(b) What is culturable command area? The gross commanded area for a distributary is 6000 hectares, 80% of which is culturable irrigable. The intensity of irrigation for Rabi season is 50% and that for Kharif season is 25%. If the average duty at the head of the distributary is 2000 hectares/cumecs for Rabi season and 900 hectares/cumecs for Kharif season, find out the discharge required at the head of the distributary from average demand considerations.

**4.** **Attempt any *one* part of the following:** **10 x 1 = 10**

(a) What are the advantages of lining of irrigation canal? Derive an equation of benefit-cost ratio while analyzing the lining of existing canal.

(b) How leaching effects the salinity of land. Briefly explain the leaching requirement of the soil?

**5.** **Attempt any *one* part of the following:** **10 x 1 = 10**

(a) What is the difference between weir and barrages? Explain with the help of diagram.

(b) Explain the significance of Khosla's theory for seepage flow. Also explain the concept of flow net and critical exit gradient.

**6.** **Attempt any *one* part of the following:** **10 x 1 = 10**

(a) What are the different storage zones of reservoir? Draw a neat labeled sketch.

(b) Write down the design principles of cross drainage works with a neat sketch.

**7.** **Attempt any *one* part of the following:** **10 x 1 = 10**

(a) A common load is shared by two hydel stations; one being a base load station with 22 MW installed capacity, and the other being a Stand-By station with 24 MW capacity. The yearly output of the stand-by station is $11 \times 10^6$ kWh and that of the base load plant as $112 \times 10^6$ kWh. The peak load taken by stand-by station is 14 MW and this station works for 2512 hours during the year. The base load station takes a peak of 19 MW. Find out :
  (i)    Annual load factors for both stations.
  (ii)   Plant use factors for both stations.
Capacity factors for both stations.

(b) What are the different types of spillways? Design the practical profile a gravity dam made of a stone masonry given the following data:
R.L of base of dam = 195m
R.L of HFL of reservoir = 230m
Specific gravity of masonry = 2.4
Safe compressive stress in masonry = 1200 KN/m$^2$