

**College of Engineering, Pune**  
**END SEMESTER EXAM**  
**B.Tech (Civil)**  
**(CE402) WATER RESOURCES ENGINEERING-II**

Max. Marks-60

Duration – 3 hours

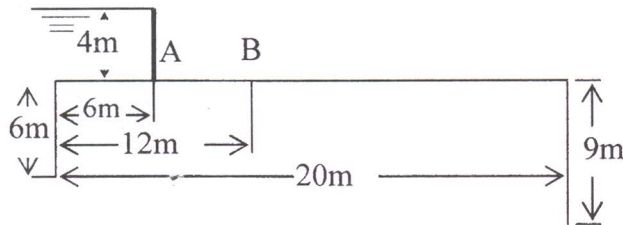
Instructions:

1. Draw neat figures wherever required.
2. Assume suitable data if necessary.
3. Use of scientific calculator is allowed.
4. Figures to the right indicate full marks.

- Q.1** Attempt any FIVE. **10**
- a) State any four limitations of Bligh's theory.
  - b) Differentiate between barrage and weir.
  - c) Write a note on the selection of suitable type of turbine for a hydroelectric scheme.
  - d) Draw a neat layout of a diversion head-works and indicate the various components of the same.
  - e) Compute the discharge over an ogee spillway with coefficient of discharge equal to 2.5 at a head of 4m. The effective length of the spillway is 100m. Neglect the velocity of approach.
  - f) Explain the method of locating centre of the critical slip circle of stability analysis of the slope of an earthen dam.
- Q.2** a) An earth dam made of a homogeneous material has the following data. **05**
- Level of top of dam = 500.0m,  
Level of the deepest river bed = 478.0 m  
F.R.L. of reservoir = 497.5m,  
Width of the top of dam = 4.5m  
Upstream slope = 3:1 ,  
Downstream slope = 2:1  
Coefficient of permeability of dam material =  $5 \times 10^{-4}$  cm/sec  
Determine (i) the seepage line (coordinates) for this dam section if a horizontal filter of length equal to 25 m is provided inward from the downstream toe of the dam, and (ii) the discharge passing through the dam.
- b) Discuss various methods used for energy dissipation below spillways. **05**
- Q.3** a) State the important types (any Five) of river training methods indicating the purpose for which each type is adopted **05**

- b) Design a trapezoidal shaped concrete lined channel to carry a discharge of 200 cumecs at a slope of 30 cm/km. The side slopes of the channel may be taken as 1.5 H: 1V. The value of  $N$  for lining is 0.017. Assume limiting velocity in the channel as 2 m/sec. **05**

- Q.4** a) Figure shows the section of a hydraulic structure founded on permeable foundation. Specific gravity of the floor material,  $G = 2.24$ . Calculate the average hydraulic gradient. Also, find the uplift pressures at points A and B, and the thickness of the floor at these points using Lane's theory. No intermediate pile is provided. **05**



- b) Discuss with neat sketches, the various types of cross drainage works used in canal systems. What considerations govern the selection of the different types of works, mainly depending upon the levels of the canal and the drainage? **05**

- Q.5** a) A concrete dam can be assumed to be trapezoidal in section having a top width of 2m and bottom width of 10m. Its height is 12m and the upstream face has a slope of 1: 10. Determine the factor of safety against overturning and sliding of the dam for the base section in the full reservoir condition assuming no free board allowance. Assume there is no tail water. Also determine the normal stresses at the toe and heel. Assume weight of concrete = 24 kN/m<sup>3</sup>; weight of water = 10kN/m<sup>3</sup> and coefficient of friction between concrete and foundation soil to be 0.7. **06**

- b) Three turbo-generators each of capacity 10MW have been installed at a hydel power station. During a certain period, the load on a hydropower plant varies from 12MW to a maximum of 26 MW. Calculate (a) total installed capacity of the plant; (b) plant factor; (c) utilization factor; (d) load factor. **04**

- Q.6** a) Using Lacey's theory, design an irrigation channel in alluvial soil for the following data : **05**  
Discharge  $Q = 30$  cumecs, Silt factor  $f = 1.00$ , and side slopes = 1/2 H: 1V.  
Find also the longitudinal slope.

- b) State the functions of (a) surge tank b) berms c) rock toe d) fish ladder e) galleries. **05**

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