

IV B.Tech I Semester Regular Examinations, October/November - 2019

## WATER RESOURCES ENGINEERING - II

(Civil Engineering)

Time: 3 hours

Max. Marks: 70

*Question paper consists of Part-A and Part-B**Answer ALL sub questions from Part-A**Answer any FOUR questions from Part-B*

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**PART-A (14 Marks)**

1. a) State the role of water in plant growth. [2]
- b) Enumerate the advantage and disadvantages of canal lining. [2]
- c) What are the objectives of river training works? [2]
- d) Distinguish between Weir and a barrage. [3]
- e) Highlight various zones of storage possible for reservoir planning. [2]
- f) Classify various types of spillways. [3]

**PART-B (4x14 = 56 Marks)**

2. a) Discuss various standards of water quality to be maintained to make water suitable for irrigation. Also state the limitations for the same. [5]
- b) Define consumptive use and explain the various methods adopted for the measurement of the same. [5]
- c) List out the objectives and limitations of irrigation. [4]
3. a) Using Lacey's method, design an irrigation channel for the following data: Discharge,  $Q = 55 \text{ cumec}$ , silt factor,  $f = 1$ , side slopes = 0.75 : 1. [9]
- b) Give the detailed comparison between Kennedy's and Lacey's theory of design of channels. [5]
4. a) Differentiate between Syphon aqueduct and canal syphon. [5]
- b) Define Proportionality of an outlet. Find the expression for the setting of both the types. [6]
- c) Highlight the functions of a distributor head regulator. [3]
5. a) Discuss the design steps involved in the design of impervious floors for subsurface flow. [6]
- b) Draw the layout of the diversion head works. Mark the components and explain each one of the. [8]
6. a) Write detailed note on drainage galleries. [6]
- b) Discuss in brief Graphical and Analytical method of stability analysis for gravity dams along with the required equations wherever applicable. [8]
7. a) Describe by means of suitable sketches various structural failures possible in earthen dams. [6]
- b) Compute the discharge over an Ogee spillway with a coefficient of discharge,  $C = 2.5$  at a head of 4.5m. The effective length of the spillway is 115m. Neglect the velocity of approach. [8]

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**PART-A (14 Marks)**

1. a) How does crop rotation contribute towards soil fertility? Explain with suitable example. [3]
- b) Show the detailed classification of canals by means of neat sketch. [2]
- c) Find the relation between sensitivity and flexibility of an outlet. [3]
- d) Define the term exit gradient. State its importance in Diversion head works. [2]
- e) Highlight various forces that act on gravity dams. [2]
- f) Enumerate the criteria for the safe design of earthen dams. [2]

**PART-B (4x14 = 56 Marks)**

2. a) Estimate the evapotranspiration using Penman Method for the following data: Month – May, latitude – 25°N, Elevation – 1175m above mean sea level, max temperature – 42°C, minimum temperature – 23.5°C, actual sunshine hours – 6.5h, wind velocity at 4m height – 180km/day, mean relative humidity – 72%. Assume any other data suitably. [10]
- b) Enumerate the various factors governing duty and delta. [4]
3. a) Define Balanced depth of cutting. Calculate the balancing depth of the channel section having bed width 17.5m, side slopes 1:1 in cutting and 2:2 in filling. The bank embankments are kept 3.8m higher than the ground level and crest width of banks as 2.4m. [10]
- b) Highlight the design procedure adopted for the design of channels using Lacey's theory. [4]
4. a) By means of neat sketches, explain various types of falls. [8]
- b) Explain the method of fixing of water-way of drain in an aqueduct. [6]
5. a) Discuss in detail the three stages of check for stability in the design of weir walls. [4]
- b)

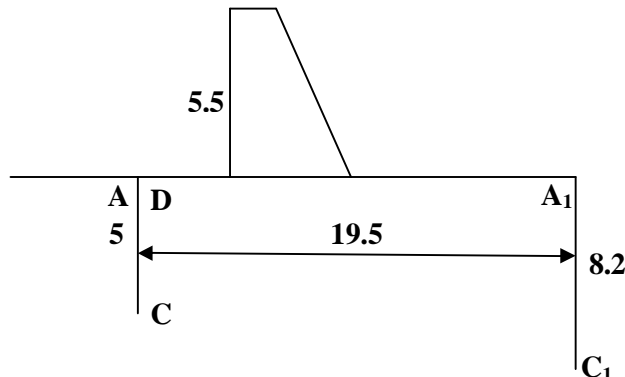


Figure 5(b)

Using Khosla's curves, determine the uplift pressure at points A, D, C, A<sub>1</sub> and

6. a) A masonry dam 10m high is trapezoidal in section with a top width of 1.2m and bottom width of 9.0m. The face exposed to water has a batter 1:10. Test the stability of the dam. Find out the principal stresses at the toe and heel of the dam. Assume unit weight of masonry as  $2240 \text{ kg/m}^3$ , specific density for water is  $1000 \text{ kg/m}^3$  and permissible shear stress of the joint =  $14.5 \text{ kg/cm}^2$ . [9]
- b) What are the various factors governing the site selection for reservoir? Explain the significance of each. [5]
7. a) Explain the method of locating centre of the critical slip circle of stability analysis of the slope of an earthen dam. [10]
- b) Write short notes on the Ogee-shaped Spillway. [4]



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**PART-A (14 Marks)**

1. a) What is meant by Net and Gross Irrigation Water requirement? [3]
- b) Highlight the drawbacks of Kennedy's theory. [3]
- c) State the functions of cross regulators. [2]
- d) Enumerate the causes of failures of weirs on permeable foundations. [2]
- e) Distinguish between a low gravity dam and high gravity dam. [2]
- f) Define the term: construction pore pressure and phreatic line. [2]

**PART-B (4x14 = 56 Marks)**

2. a) Write a detailed note on the following: [6]
  - (i) Principal crops and crop seasons
  - (ii) Frequency of Irrigation
- b) Find the delta for a crop when its duty is 975 hectares/cumec on the field, the base period of this crop is 120 days. [8]
3. a) Derive the relation for perimeter – discharge,  $V-Q-f$  from Lacey's fundamental equations. [6]
- b) Design an irrigation channel to carry a discharge of 2.5 cumec. Assume  $N = 0.025$ ,  $m = 1$ , and  $B/D$  ratio = 5.5. [8]
4. a) Distinguish between non-modular and semi-modular outlets. Give examples. [7]
- b) Explain how and why the various approaches followed for River Training works. [7]
5. a) Show the detailed classification of diversion head works. [6]
- b) Explain Khosla's method of independent variables. How do you apply corrections for thickness of floor and interference of piles? [8]
6. a) Explain the method of determining principal and shear stresses in a gravity dam. [5]
- b) Provide the detailed classification of types of dams. [4]
- c) What is the significance of mass inflow curve and how is it prepared? [5]
7. a) A homogeneous earth dam has 5m top width and side slopes on the upstream side is 2.5:1 and downstream side is 2:1. Total height of the dam 22m including the free board. A drainage filter is provided for a width of 7m on the downstream side. Dry density is  $1800 \text{ kg/m}^3$ , saturation density =  $2200 \text{ kg/m}^3$ , average angle of friction =  $30^\circ$ , average cohesion =  $1600 \text{ kg/m}^3$ , average unit weight =  $1700 \text{ kg/m}^3$ ; average cohesion =  $5000 \text{ kg/m}^3$ ; average angle of internal friction is  $7^\circ$ . Check the stability of the section: sloughing of upstream slope during sudden drawdown, stability of foundation against shear. [10]
- b) Explain the importance of spillway stilling basins and its appurtenances? [4]

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**PART-A (14 Marks)**

1. a) Show and explain the detailed classification of soil-water. [3]
- b) State the procedure involved in the designing the non-erodible channels using method of economic sections. [3]
- c) What is the necessity of canal falls? [2]
- d) Highlight the salient features of Bligh's creep theory. [2]
- e) Define the term: surcharge storage, safe yield. [2]
- f) Enumerate the measures for control of failures in earthen dams. [2]

**PART-B (4x14 = 56 Marks)**

2. a) Describe the detailed classification of water application methods. State the advantages and disadvantages of each of the method. [5]
- b) If the kor watering period for rice is 12 days and it requires 55cm of water. In form of the rainfall, the field receives 10cm per day. What is the area that can be irrigated with 1 cumec and 5 cumec of discharge? [4]
- c) Define and explain the reasons for water logging and drainage. [5]
3. a) Give the detailed comparison between Kennedy's and Lacey's theory of design of channel. [7]
- b) Explain the necessity, limitations, advantages and disadvantages of canal lining. [7]
4. a) Discuss the stepwise design principles involved in the Cross regulator. [7]
- b) Give Bligh's approximate method of determining uplift pressure under the floor of a cross-drainage work. [7]
5. a) Explain the corrections to be carried out at key points by considering simple profiles in a weir. [6]
- b) By means of a neat sketch, highlight various components of diversion head works. Explain each term in detail. [8]
6. a) Discuss the detailed classification of dams according to hydraulic design and use. Also mention its advantages and disadvantages. [7]
- b) Enumerate the steps involved along with all the equations in the design of gravity dams. Also mention the check wherever applicable. [7]
7. a) Explain the procedure to check the stability of upstream slope of an earth dam during sudden drawdown condition with a neat sketch. [7]
- b) Give the detailed classification of various types of spillway crest gates. State the limitations, advantages and disadvantages of each. [7]