

Register No.: ..... Name: .....

**SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)**

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

**SIXTH SEMESTER B.TECH DEGREE EXAMINATION (S), AUGUST 2023****CIVIL ENGINEERING****(2020 SCHEME)****Course Code: 20CET306****Course Name: Design of Hydraulic Structures****Max. Marks: 100****Duration:4 Hours**

- *Use of Khosla's chart, Blench curve and Montagues curve are permitted in the examination hall*
- *Assume suitable data wherever necessary.*

**PART A**

*(Answer any one full question from each module. Each question carries 15 marks)*

**MODULE I**

1. a) What are the limitations of Bligh's creep theory? (5)
- b) Sketch the layout of diversion headworks, mark the components and describe the functions of each component. (10)

**OR**

2. a) Explain any three different types of weirs with neat sketches. (6)
- b) Calculate the length of waterway, regime scour depth and the total energy level at the upstream of a vertical drop weir for the following data. Maximum flood discharge = 2600 cumecs  
HFL before construction = 290.0 m (9)  
Minimum water level = d/s bed level = 283.0 m  
F.S.L of canal = 289.0 m  
Allowable flux = 1.2 m and  $f=1$

**MODULE II**

3. a) Design an irrigation channel to carry a discharge of 5 cumecs. Assume  $N = 0.0225$  and  $m = 1$ . The channel has a bed slope of 0.2m per kilometer. (9)
- b) Explain Type I, Type II and Type III aqueducts with neat sketches. (6)

**OR**

4. a) Explain the different types of canal falls with neat sketches. (8)
- b) A regime channel has to be designed for the following data:  
Discharge = 100 cumecs (7)  
Silt factor,  $f = 1.1$

Assume side slopes of 0.5 horizontal to 1.0 vertical.

**PART B**

**(Answer any one full question. Question carries 50 marks with 25 marks for design and 25 marks for drawing.)**

**MODULE III**

5. a) Design a 2 metre trapezoidal notch fall for the following data:
- Details of the canal above drop**
- Full supply discharge = 6 cumecs  
 Bed width = 6.00 m  
 Bed level = 12.00 m  
 Full supply depth = 1.50 m  
 Full supply level = 13.50 m  
 Top of bank 2.00 m wide at level 14.50 m  
 Half supply depth = 1.00 m
- Details of the canal below drop**
- Full supply discharge = 6 cumecs  
 Bed width = 6.00 m  
 Bed level = 10.00 m  
 Full supply depth = 1.50 m  
 Full supply level = 11.50 m  
 Top of bank 2.00 m wide at level 12.50 m  
 Good soil for foundation is available at 9.50 m  
 Assume any other required data suitably.
- b) Prepare the following drawings (not to scale)
- i) Half plan at top and half at the foundation level. (25)
- ii) Section across the channel through the notch fall.

**OR**

6. a) Design a suitable cross drainage work for the following hydraulic particulars:
- Discharge of the canal = 33 cumecs  
 Bed width of the canal = 20m  
 Depth of water in the canal = 1.6m  
 Bed level of canal = 250.00m
- High flood discharge of the drainage = 400 cumecs  
 High flood level of drainage = 253.00m  
 Bed level of drainage = 248.00m  
 General ground level = 250.00m
- b) Prepare the following drawings (not to scale)
- (i) Half plan at top and half at the foundation level. (25)
- (ii) Longitudinal section along drain.

**PART C**

***(Answer any one full question from each module. Each question carries 10 marks)***

**MODULE IV**

7. a) What are the steps involved in the stability analysis of a gravity dam using analytical method? (5)  
b) List the different types of galleries. Explain any one in detail. (5)

**OR**

8. a) What are the functions of shafts and keys in a gravity dam? (5)  
b) Explain the grouting of foundation in detail. (5)

**MODULE V**

9. a) What are the causes leading to the structural failure of an earth dam? Explain. (5)  
b) Sketch the layout of a Type I stilling basin and explain its components. (5)

**OR**

10. a) What are the limitations of thin cylinder theory? (5)  
b) Explain the working of a shaft spillway with a neat sketch. (5)

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