



**UNIVERSITY OF PETROLEUM & ENERGY STUDIES
DEHRADUN**

End Term Examination –December, 2017

Name of the Program/course: B.Tech Civil Engg.

Semester – 7th

Subject Name: Design of Hydraulic Structures

Max. Marks : 100

Subject Code : CEEG421

Duration : 3 Hrs

This question paper has two page(s).

Note:- Attempt all questions from section A &B. Attempt any two questions from Section C

1.	Derive an expression for the limiting height of a dam gravity dam.	[4]
2.	What do you understand by Biff wall and deflector wall?	[4]
3.	Discuss about relief wells and drain trenches.	[4]
4.	What was the reason for the failure of Khadakwasla dam in 1864-1961.	[4]
5	What is the purpose of providing cross drainage works?	[4]
SECTION B (Attempt All Questions)		
5.	What do you understand by Critical slip circle? Describe how it can be located for different soils.	[10]
6	An earth dam is having a base width of 173m and height 30 m which includes a free board of 3 m. Top width of earth dam is 8 m. The u/s and d/s slopes are 3H:1V & 2.5H:1V. A drainage filter of 30 m length is provided at the toe of dam. Draw the top flow line. If coefficient of permeability of the soil material used in the dam is 5×10^{-4} cm/sec. find the seepage flow per unit length of the dam.	[10]
7	An ogee spillway has 20 crest gates each having 10 m clear span. Find the maximum flood that can be safely passed by lifting all the gates when the maximum reservoir elevation is 110.00 m and the crest level is 106 m. Take coefficient C as $2.16 \text{ m}^{1/2}/\text{s}$. Coefficient of end contractions are 0.05 and 0.10 for piers and abutments respectively. Neglect velocity of approach.	[10]
8	Determine the central angle of arch dam at which minimum concrete is required.	[10]
Section C		
9(a)	Draw a sketch for the stilling basin: i When TWRC is greater than JHC & for the stilling basin ii when TWRC is greater than JHC for low discharge and JHC is greater than TWRC for high discharge .	[4+8]
9(b)	Explain about function of intake structure and forebay components of hydroelectric power station	[8]
10	Design a cross regulator for a distributary taking off from a branch canal for the following data Discharge of branch channel = 105 cumec Discharge of distributary = 15 cumecs	[20]

	<p>FSL of branch channel = $\frac{U/S}{D/S} = \frac{118.10 \text{ m}}{117.90 \text{ m}}$</p> <p>Bed width of branch channel = $\frac{U/S}{D/S} = \frac{45 \text{ m}}{41 \text{ m}}$</p> <p>Depth of branch channel = $\frac{U/S}{D/S} = \frac{2.5 \text{ m}}{2.5 \text{ m}}$</p> <p>FSL of distributary = 117.20 m</p> <p>Bed width of distributary = 15 m</p> <p>Depth of water in distributary = 1.6 m</p> <p>Permissible exit gradient = 1/5</p>	
11	<p>For the cross section of gravity dam show in figure, check the stability for the reservoir for full conditions. Assume line of drain holes 8.0 m downstream from the upstream face of the dam. Also find out principal and shear stresses at the heel and tow. Neglect earthquake forces. Consider $\mu = 0.75$ Consider weight of dam, weight of water and uplift pressure. All dimensions are in metre.</p> <p>Take average shear strength(q) = 1.4 MPa and weight of Concrete = 24 KN/m³.</p>	[20]

