Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2022

Course: Design of Hydraulic Structures — **Semester: VIII**
Program: B Tech Civil Engineering — **Time: 03 hrs.**
Course Code: CIVL 4002 — **Max. Marks: 100**

Instructions: Attempt all the question

Set-1

SECTION A
(5Qx4M=20Marks)

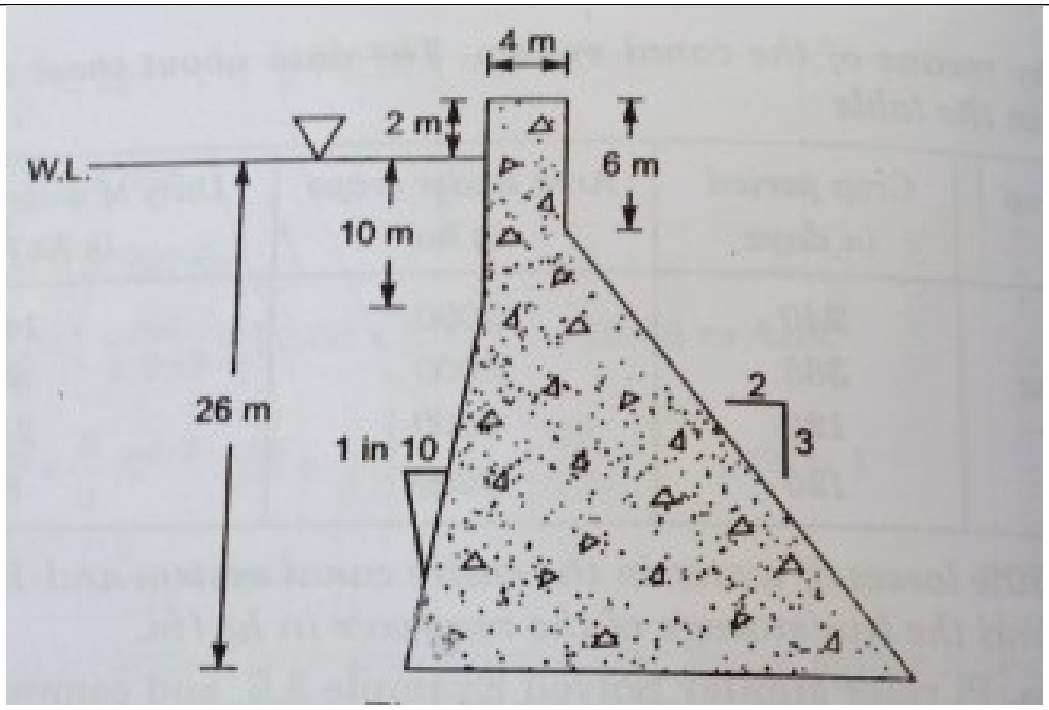
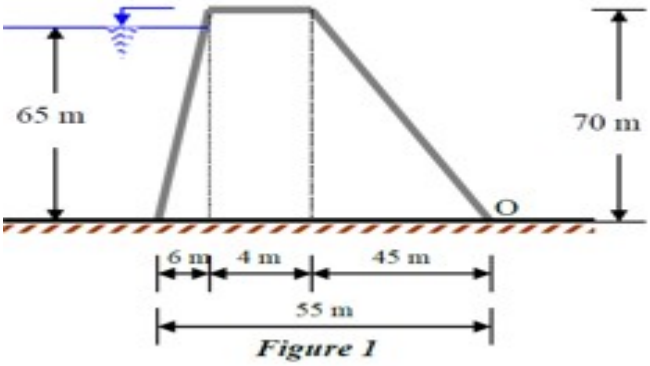
S. No.		Marks	CO
Q1	Mention the design criteria of the used in **Hoover** dam.	**4**	**CO1**
Q2	What are the type of spillways used in Tehri Dam? Also mention the design methodology used for Tehri Dam	**4**	**CO1**
Q3	Spillways are the safety valve of the dam. Comment	**4**	**CO1**
Q4	Differentiate the following: a) Pondage and Storage b) Run-off river plants and pumped storage plants	**4**	**CO1**
Q5	Explain the role of trap efficiency in reservoir sedimentation and suggest measures to reduce the sedimentation.	**4**	**CO1**

SECTION B
(4Qx10M= 40 Marks)

Q6	Draw the top seepage line for the dam section shown below: Top width = 6m u/s side slope = 1H:1V d/s side slope = 1H:1V u/s water depth = 20m Free board = 2m Also determine the seepage discharge, if the length of the dam is 3000m and the value of K = 3 x 10^{-3} mm/s	**10**	**CO2**
Q7	Explain the design and specifications for the Guide banks with the help of diagram as per the IS specifications.	**10**	**CO1**
Q8	The yearly rainfall data for a proposed reservoir for 35 years is given below. Compute 60% and 90% dependability.	**10**	**CO2**

Year	Annual Rainfall (cm)	Year	Annual Rainfall (cm)
1956	98	1978	208
1957	100	1979	114
1958	101	1980	104
1959	99	1981	120

	1960	85	1982	108	
	1961	112	1983	102	
	1962	116	1984	80	
	1963	78	1985	109	
	1964	160	1986	122	
	1965	66	1987	115	
	1966	184	1988	140	
	1967	90	1989	138	
	1968	76	1990	60	
	1969	118			
	1970	86			
	1971	92			
	1972	96			
	1973	93			
	1974	88			
	1975	94			
	1976	107			
	1977	110			
		OR			
Q8	In a hydraulic jump taking place in a horizontal apron below an Ogee shaped weir the discharge per unit width is 0.25 $m^3/s/m$ and the energy loss is 2.75 m. Estimate the depths at the toe and heel of the jump			**10**	**CO2**
Q9	Find the maximum power the can be transmitted by a power station through a hydraulic pipe of 5 Km long 1000 mm diameter. The pressure of water at the power station is 1500 MPa. Take f = 0.01			**10**	**CO2**
	SECTION-C **(2Qx20M=40 Marks)**				
Q10	Determine the length of an overflow spillway to pass 60 m^3/sec with a depth of flow upstream not to exceed 1.50 m above the crest. The spillway is 2.50 m high. The upstream face is sloped 1:1. For 60 m^3/sec, the tail-water rises 1.00 m above the crest. The spillway is designed for the maximum head. **Calculate both the profiles and sketch the results**. Assume any missing data suitably.			**15+5**	**CO3**
Q11	A part of the solid gravity dam (sp. gr. of 2.64) is shown in its cross-section. Take uplift factor as 0.7. Draw a tabular statement for analysis of forces at horizontal section is 26m below water level. No ice, wind or seismic forces need to be considered. With the help of the above statement also test the stability of the dam against all the forces. Allowable compressive stress in concrete is 5500 KN/m^2.			**20**	**CO3**

			
	OR		
Q11	Analyze the stability of given gravity dam (Figure 1) for the following conditions: Friction coefficient between concrete-foundation is 0.70, respectively. Allowable shear stress at the foundation level is 2200 kN/m^2, allowable compressive and shear stresses in concrete are 2700 kN/m^2, and 2400 kN/m^2, respectively. Allowable compressive stress in foundation material is 2700 kN/m2. Take specific weights of concrete and water as kN/m^3, and 10 kN/m^3, respectively.  *Figure 1*	**20**	**CO3**