

Name:

Enrolment No:



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

Course: Design of Hydraulic Structures
Program: B Tech Civil Engineering
Course Code: CIVL 4043P

Semester: VII
Time: 03 hrs.
Max. Marks: 100

Instructions: Attempt all the questions

Set-2

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q1	Mention the design criteria of the used in Sardar Sarovar Dam .	4	CO1
Q2	Both silt-clay and coarse sand are available at the site. Hard stratum is available at about 5m below the natural ground. Draw a neat section for an earth dam pertaining to above site.	4	CO1
Q3	Explain with the help of a sketch the energy dissipation process in case JHC coincides TWC.	4	CO1
Q4	Differentiate the following: a) Dependability and probability of exceedance b) Forebay and penstock	4	CO1
Q5	Explain the role of draft tube with reference to hydraulic turbine design.	4	CO1

SECTION B
(4Qx10M= 40 Marks)

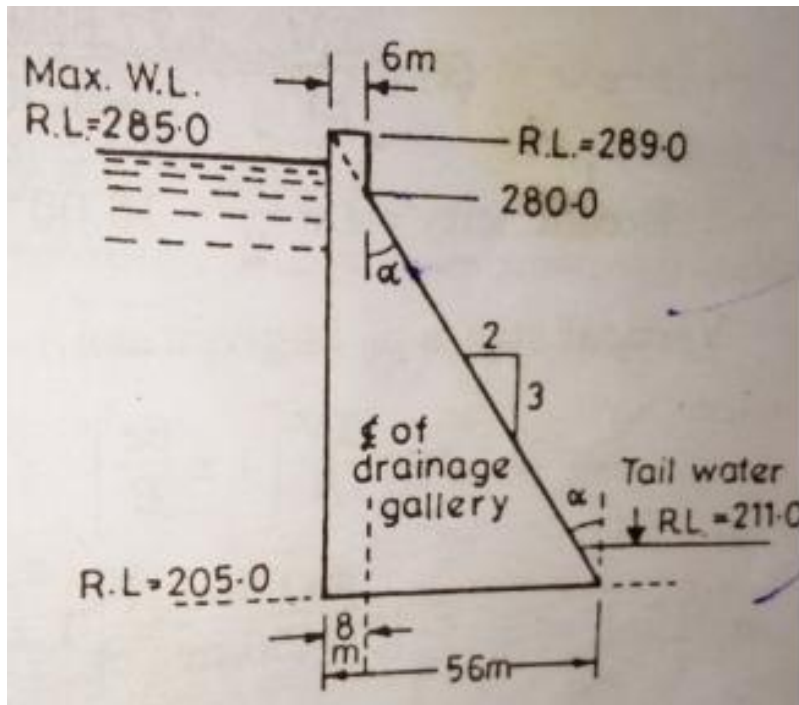
Q6	A run-off the river scheme plant having a minimum flow of 25 cumecs. If the plant is used as a peak load plant operating for 5 hours daily, compute the firm capacity: a) Without pondage b) With pondage but allowing 10% water to be lost in evaporation and other losses. Head at the plant is 16m and plant efficiency is 75%.	10	CO2
Q7	Explain the design and specifications for the spurs with the help of diagram as per the IS specifications.	10	CO1
Q8	A reservoir is proposed for a catchment area. The details are as follows: Capacity =1500 ha-m. Catchment = 200 km ² , Annual average streamflow =0.1m of runoff. If the annual sediment production is 0.05 ha-m/ km ² , what is the probable life of reservoir before its capacity is reduced by 10 % of its initial capacity.	10	CO3

C/I	0.01	0.02	0.04	0.06	0.08	0.1	0.2	0.3	0.5	0.7
η%	43	60	74	80	84	87	93	95	96	97

OR			
Q8	What is a flow net? How is it useful in the analysis of an earth dam? A Flow net is plotted for a homogeneous earthen dam of height 20m and a free-board of 2.0 m. The no. of potential drops = 8 and flow channels are 4 in number. The dam has a horizontal filter of 30m length at the d/s end and $k = 8 \times 10^{-4}$ cm/sec. calculate the discharge per m run of the dam.	10	CO2
Q9	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

SECTION-C
(2Qx20M=40 Marks)

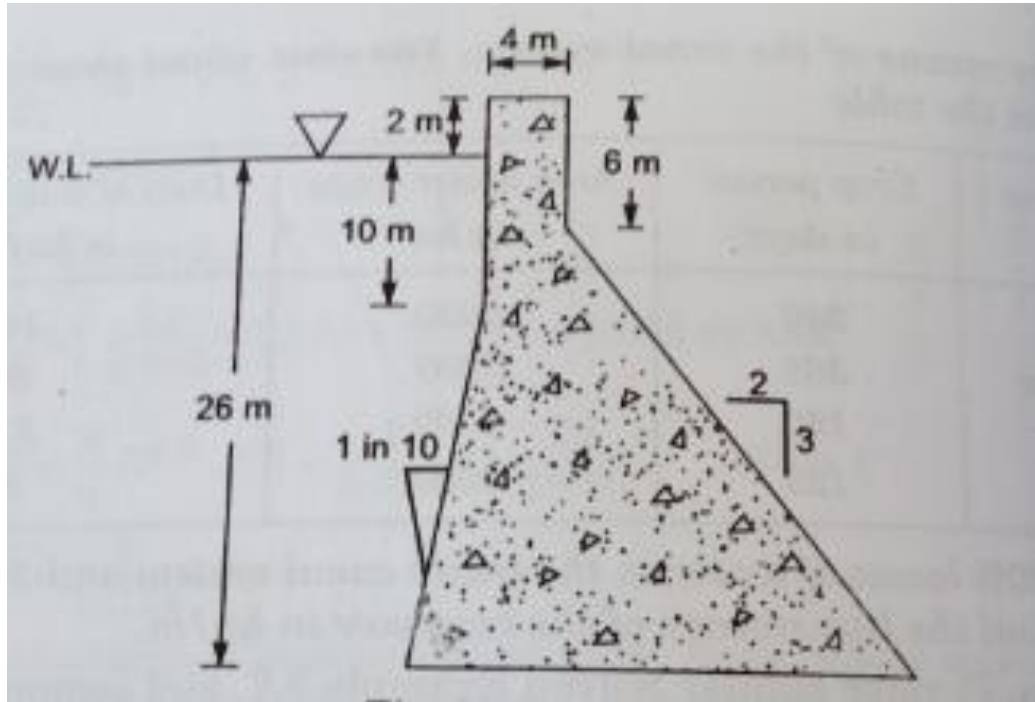
Q10	Design an overflow spillway section for a design discharge of 1800 m ³ /sec. The upstream water surface level is at elevation 230 m and the upstream channel floor is at 210 m. The spillway, having a vertical face, is 50 m long. Values of K and n are 2 and 1.85 respectively. Assume all the other values required suitably.	20	CO3
Q11	<p>Given fig. shows the section of a gravity dam (non-overflow portion) built of concrete. Calculate (neglecting earthquake effects):</p> <p>(i) The maximum vertical stresses at the heel and toe of the dam.</p> <p>(ii) The major principal stress at the toe of the dam.</p> <p>(iii) The intensity of shear stress on the horizontal plane near the toe.</p>	20	CO3



OR

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 tubular 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