BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: B.TECH.   SEMESTER : IV
BRANCH: CIVIL   SESSION : SP/2023

SUBJECT: CE417 DESIGN OF HYDRAULIC STRUCTURES

TIME: 3 Hours   FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

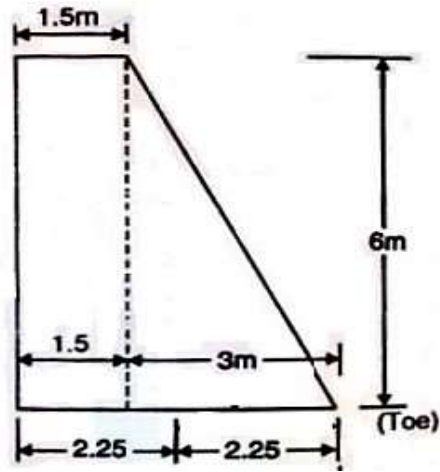|			CO	BL
Q.1(a)	What is a gravity dam? Explain various forces that act on a gravity dam.	[5]	1	2
Q.1(b)	A 6m high gravity dam is 1.5 m wide at the top and 4.5 m wide at the bottom, with a vertical water face as shown in Fig.1. Determine the normal stresses at the toe and heel for reservoir empty conditions. Take the specific gravity of the dam material as 2.4.	[5]	1	3

Fig. 1

|				
Q.2(a)	Write short notes on: (i) fish ladder, (ii) divide wall, (iii) Afflux, (iv) waterway, and (v) u/s and d/s launching aprons.	[5]	2	1
Q.2(b)	The section of a hydraulic structure is founded on the sand as shown in the Fig. 2. Calculate the average hydraulic gradient as per Bligh's seepage theory. Also, find the uplift pressures at points 6 and 18 m from the u/s end of the floor and find the thickness of the floor at these points. Take the specific gravity of floor material as 2.24.	[5]	2	3

Fig.2

PTO
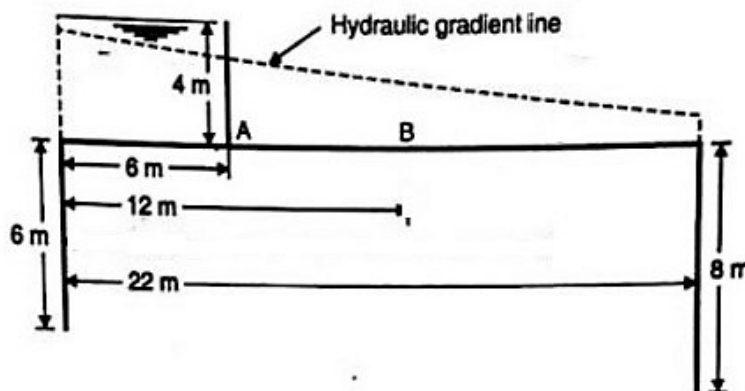
Q.3(a) Design a Sarda type fall which includes calculation of H and d, design of crest, design [5] 3 3
of cistern, and design of impervious floor for the following data:

Full supply discharge: $\frac{u/s}{d/s} = 40$ cumecs

Full supply level   : $\frac{u/s}{d/s} = \frac{218.30\text{ m}}{216.80\text{ m}}$

Full supply depth   : $\frac{u/s}{d/s} = \frac{1.8\text{ m}}{1.8\text{ m}}$

Bed width   : $\frac{u/s}{d/s} = \frac{26\text{ m}}{26\text{ m}}$

Bed level   : $\frac{u/s}{d/s} = \frac{216.50\text{ m}}{215.00\text{ m}}$

Drop   : 1.5 m

Q.3(b) Describe the necessity and functioning of a 'Distributory head regulator' and a 'Cross- [5] 3 2
regulator' in a canal project.

Q.4(a) What is meant by cross drainage works and what is their importance in a anal project?   [5] 4 2
Q.4(b) Describe following types of cross drainage works: (i) Aqueduct, and (ii) Super passage. [5] 4 2

Q.5(a) What are 'Canal Outlets or Canal Modules'? What are the requirements of a good   [5] 5 2
module?
Q.5(b) What is the use of 'Canal Escapes' in a canal project? What are its different types?   [5] 5 2

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