Enrollment No: _____ Exam Seat No: _____

C.U.SHAH UNIVERSITY

Summer Examination-2018

Subject Name : Design of Hydraulic Structures

Subject Code : 4TE06DHS1 **Branch :** B.Tech. (Civil)

Semester : 6 **Date :** 25/04/2018 **Time :** 02:30 To 05:30 **Marks :** 70

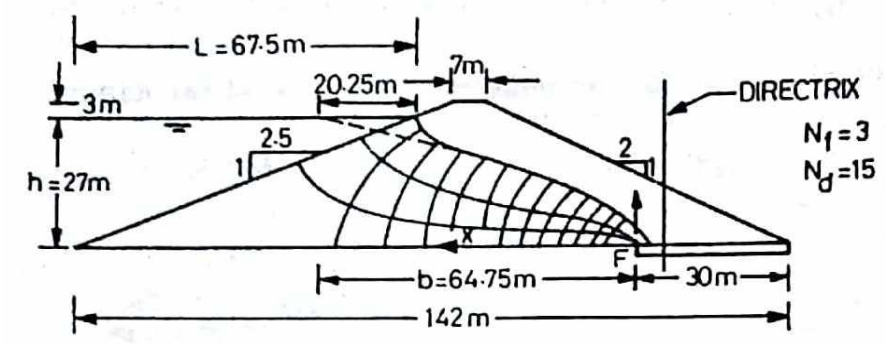
Instructions:

(1) Use of Programmable calculator & any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

Q-1		**Attempt the following questions:**	**(14)**
	a)	What is meant by a "Dam and Reservoir"?	**01**
	b)	What is meant by 'useful storage' in a dam reservoir?	**01**
	c)	State various assumptions made in the seepage analysis.	**01**
	d)	What are the basic requirements of the filter?	**01**
	e)	What is basic function of an intake structure?	**01**
	f)	What are the functions of "Water Stops" in the gravity dam?	**01**
	g)	Define spillway.	**01**
	h)	What is meant by an energy dissipater?	**01**
	i)	Enlist various measures which are adopted for safe drainage of the seepage water through the dam and foundation.	**01**
	j)	What is stilling basins?	**01**
	k)	Enlist the functions of a cross regulator in a canal network.	**01**
	l)	What is canal escape?	**01**
	m)	The energy dissipation in a Sarda type canal drop is caused by _____.	**01**
	n)	The depth-discharge relationship of the upstream canal remains practically unaffected by the introduction of a fall of the type _____	**01**

Attempt any four questions from Q-2 to Q-8

Q-2		**Attempt all questions**	**(14)**
	(a)	Describe various criteria for safe design of earth dam.	**05**
	(b)	Explain cracking of concrete during the construction of concrete gravity dams, and its remedial measures.	**05**
	(c)	What are the ill effects of dam construction?	**04**
Q-3		**Attempt all questions**	**(14)**
	(a)	Discuss the location of the 'main spillway' and 'subsidiary spillway' in gravity dams as well as in earthen dams	**05**
	(b)	What is meant by a 'Dam sluice'? Why are such sluices necessary in dam construction?	**05**
	(c)	Describe the characteristics of concrete dams.	**04**
Q-4		**Attempt all questions**	**(14)**
	(a)	Discuss the various causes of failure of earth dams. How would you prevent different types of failures?	**07**
	(b)	Locate the phreatic line in the earth dam shown in Fig. Also draw the flow-net and determine the discharge. Take $k = 4 \times 10^{-6}$ m/s.	**07**



Q-5 **Attempt all questions** **(14)**

(a) What is phreatic line? What is its use? What are the characteristics of phreatic line? **07**

(b) Classify spillways and discuss any one in detail. Give essential requirements of spillway. **07**

Q-6 **Attempt all questions** **(14)**

(a) A siphon spillway has the following particulars: **07**
Height of the throat = 1.50 m, length of the throat = 4.0 m.
At the design discharge, the tail water elevation is 5.0 below the summit (crest) of the siphon and the head over the summit is 2.0 m. Determine:
(i) The capacity of the siphon, if C_d = 0.60.
(ii) The head that would be required on an ogee-shaped spillway with its crest at the same level to discharge the same flow. Take C_d = 2.25
(iii) The length of the ogee-shaped weir required to discharge the same flow with a head of 2.0 m over the crest.

(b) Distinguish clearly between a low gravity dam and high gravity dam. Derive An expression used for such a distinction. **07**

Q-7 **Attempt all questions** **(14)**

(a) Determine the ordinates of the seepage line through the dam section, as shown in Fig. using Casagrande method. Assume that the outer shell is made of pervious material while the central core section is made of relatively impervious material having coefficient of permeability 2.1 x 10-5 m/sec. Draw the correct nature of the seepage line applying ingress and egress corrections. Take the ratio $\frac{\Delta a}{(a+\Delta a)} = 0.34$. **10**

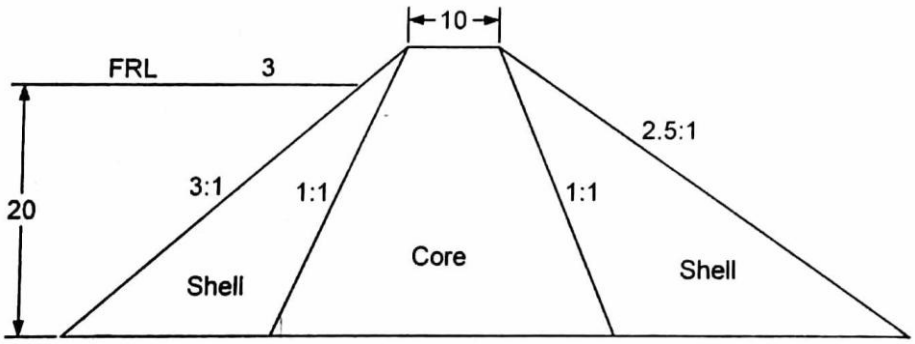


Fig. 1

(b) Distinguish between rolled fill earth dam and hydraulic fill earth dam. **04**

Q-8 **Attempt all questions** **(14)**

(a) A gravity dam is 10 m high. It has a top width of 1 m and base width 9 m. The front face is vertical. Assume that the weight of concrete is 2400 kg/m^3 and the water is stored up to the top of the dam. (Density of water 1000 kg/m^3) (a) Test the stability against overturning. (b) Determine compressive **08**

stresses and principal stresses at the toe and heel of the dam. (c) Calculate shear stress at the toe and heel of the dam. Consider only self weight of dam and water pressure.

(b) What is a fall in canal? Write necessity of a fall and governing factors in locating a fall. **06**