Mansoura University
Faculty of Engineering
Irrigation & Hydraulics Eng. Dept.

4th Year Civil Engineering
January 2013
Time allowed 4 hours

Design of Irrigation Works (II)

N. B. - All sketches should be clear, neat and well proportioned.
- Any missing data may be reasonably assumed.

ANSWER ALL QUESTIONS (MAXIMUM MARK 100)

Question I: (10 Marks)

A. Discuss the different uses of weirs. (2.5 marks)
B. State the fundamental difference between Khosla's theory and Bligh's creep theory for seepage flow below a weir. (2.5 marks)
C. Assuming a floor of hydraulic structure, as shown in Figure 1, storing 1.50 meter head of water. Use Khosla's pressure curves given in Figure 2 to draw the uplift pressure diagram. Estimate also the exit gradient. (5 marks)

Question II: (10 Marks)

A weir has to be built on a main canal (Fig. 3) according to the following data:

Max. canal discharge.	50.0 m^3/sec.
Min. canal discharge.	40.0 m^3/sec.
Bed width	8.0m
Bligh value.	15

$Q = 1.77 B \sqrt{2g} H^{1.5}$

It is required to:

A. Give a complete hydraulic design for the weir and calculate the floor thickness. (5 marks)
B. Draw a neat sketch showing the longitudinal sectional elevation of the weir. (5 marks)

Question III: (30 Marks)

A. Sketch and show how the water pressure can be equally distributed on the beam of vertical leaf gates. (2.5 Marks)
B. Explain using neat sketches the advantages of redial gates. (2.5 Marks)
C. A head regulator of branch canal feeds from a main canal according to the following data:

	Main canal	Branch canal
High water level	(20.00)	(19.60)
Bed level	(16.00)	(16.00)
Bed width	---	14.0m
Side slopes	---	3:2
Discharge	---	40m^3/sec
Width of bridge	---	10m+2 side walk 1m each

It is required to:

1. Give the hydraulic design of the regulator by determine the span and number of vents. (5 Marks)
2. Design the floor of the regulator showing the uplift diagram and the floor thickness assuming Lane coefficient = 7. (5 Marks)
3. Calculate the stresses at the base of the pier for case of maximum (My), consider a uniformly distributed live load 2 t/m^2. (5 Marks)
4. Draw to reasonable scale a longitudinal section through a regulator vent. Show all main dimensions. (5 Marks)

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Question IV: (30 Marks)

A. Discuss with sketches the advantages and disadvantages of different locations of the lock with respect to the regulator. (6 Marks)

B. A symmetrical lock will be constructed on a main canal for navigable requirement according to the following data:

	U.S.	D.S.
Water level	(30.00)	(28.00)
Bed level	(24.00)	(24.00)
Bank level	(31.00)	(31.00)

Lock chamber = 160m×15m

Angle between closed gates = 135°.

Time of emptying or filling = 12 minutes.

It is required to:

1. Design the side culvert. (6 Marks)
2. Calculate the trust force at the upper pivot of the gate of the lock chamber for the case of loading during operation. (6 Marks)
3. Show how to design the thrust wall. (6 Marks)
4. Draw a plan half earth removed, give the main levels and dimensions of the different parts of the lock. (6 Marks)

Question V: (25Marks)

A. Explain the following using neat sketches

1) The practical profile of a high gravity dam showing different zones of increasing the side slopes.

2) The effect of constructing a dam across a river on the river bed (U.S. and D.S.).

3) The suitable site for a storage reservoir. Discuss the storage losses that should be accounted for in determining the capacity of such a reservoir.

4) The precautions taken to control seepage through the body and the foundation of the High Aswan Dam.

5) The procedure used for computing the process of reservoir flood routing over an interval of time. (15 marks)

B. Figure 4 shows a non-overflow cross-section of a gravity dam. It is required to calculate the eccentricity of the resultant force acting on the dam base. The following conditions should be considered:

- Full reservoir and no tail water.
- Vertical earthquake acceleration acting upwards.
- Vertical seismic coefficient = 0.10g.
- Consider uplift pressure.
- Specific gravity of dam material = 2.3

(10 marks)

Examiners Prof. Dr. Sharl Shukry Sakla
Prof. Dr. Mahmoud Elgamal
Dr. Samer Elabd

P.T.O.

Figure 1

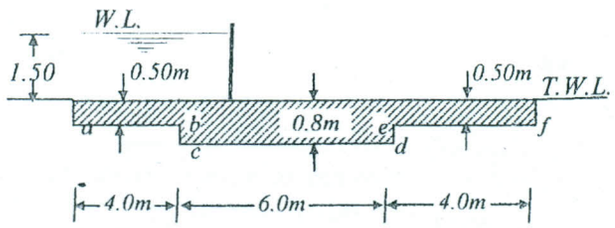
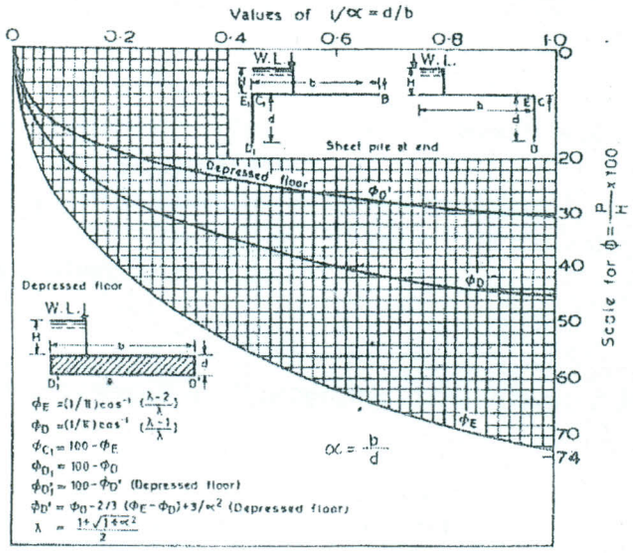


Figure 2



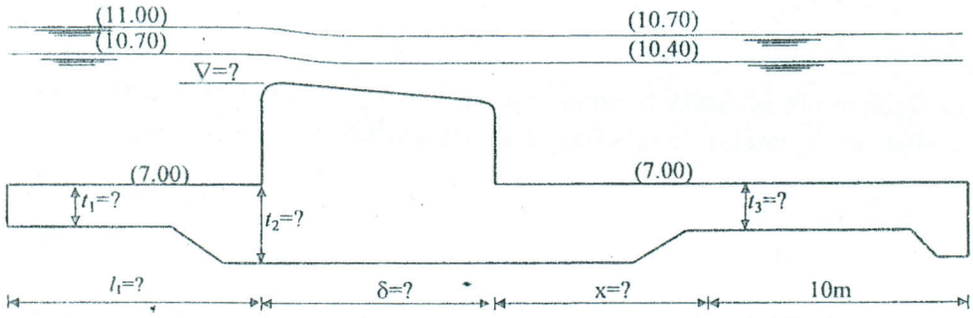


Figure 3

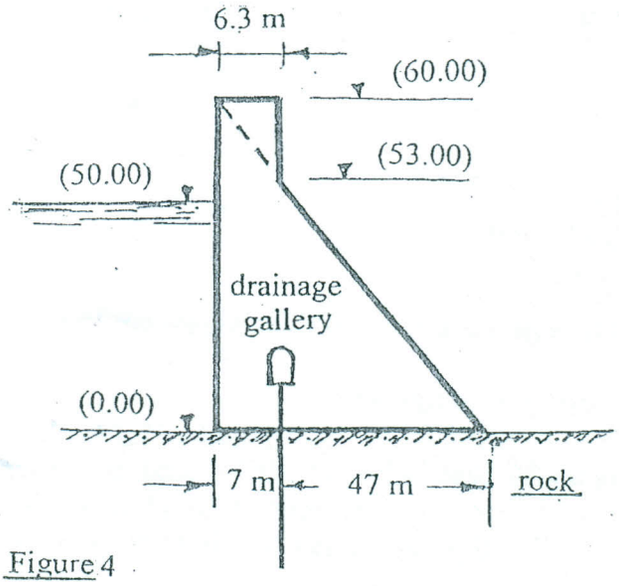


Figure 4