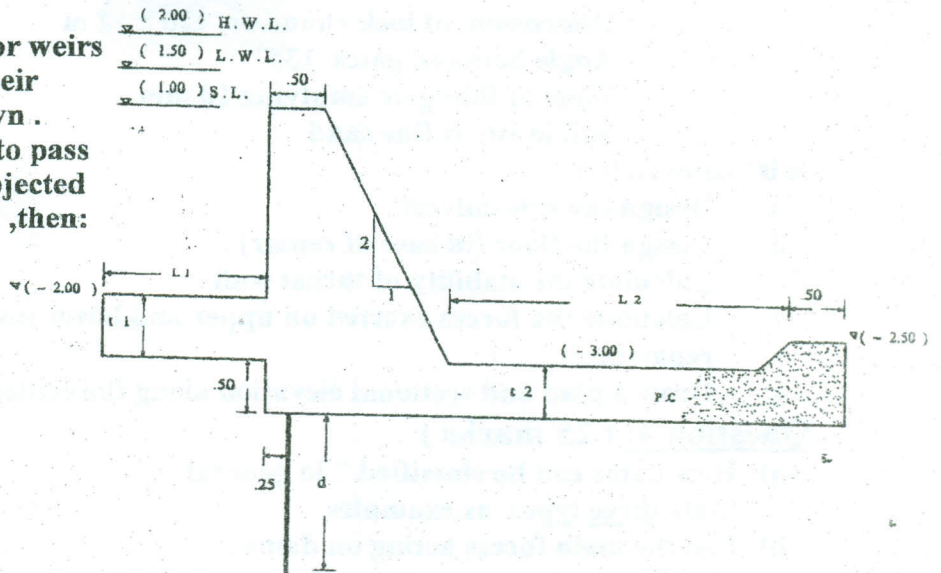


Design of Irrigation Works (II)

- N. B. :
- 1) All sketches should be clear, neat, and well proportioned
  - 2) Any missing data may be reasonably assumed
  - 3) answer the following questions

**Question 1: ( 25 marks )**

- a) State three practical uses for weirs
- b) An overfall fayoum type weir is to be constructed as shown .  
The discharge of  $10 \text{ m}^3/\text{sec}/\text{m}$  to pass over weir . the structure is subjected to both uplift and scour forces ,then:



- 1) Fix all missing dimensions to safe guard the structure against up lift and scour forces
- 2) draw using reasonable scale , the net uplift diagram according to lane's formula for worst case , lane's coefficient = 8
- 3) show extra precautions to reduce the effect of excessive uplift and scouring activities

**Question 2: ( 35 marks )**

- a) Name three types of regulators , then discuss very briefly the practical function of each of them
- b) How to distribute the lengths of the floor of regulator?
- c) An intermediate regulator will be constructed at the location of drop in the water level of main canal . the following data is available
  - Canal discharge =  $36 \text{ m}^3/\text{sec}$
  - Maximum water U.S./D.S. the regulator (20.00)/(18.00) m
  - Canal bed width = 8.0 m
  - Canal bed level = (15.00)
  - Road width = 10 m
  - Lane's coefficient = 10
  - Side slope 3 : 2

It is required to :

- 1) Find the dimensions of the regulator and vents.
- 2) Design the floor of regulator for the case of low water level upstream and a dry downstream .
- 3) Calculate the depth of sheet piles and check the scour length .
- 4) calculate the stress at the base of the pier for the case of maximum  $M_y$  . in the longitudinal direction , assume that the reaction for each girder = 8 t from the dead load and 10 t from live load
- 5) draw dimensioned plan (H.E.R.) of regulator.

**Question 3: ( 25 marks )**

- a) Discuss with sketches the advantages and disadvantage of different locations of lock with respect to regulator .
- b) State three factors to increase the practical efficiency of navigation lock .
- c) It is required to construct symmetrical lock having the following data :

U.S. Water Level ( 15.00 )  
D.S. Water Level ( 13.00 )  
Bed Level ( 10.00 )  
Dimension of lock chamber 120 x 12 m  
Angle between gates 135°  
Time of filling or emptying 10 min.  
Soil in site is fine sand

It is required to :

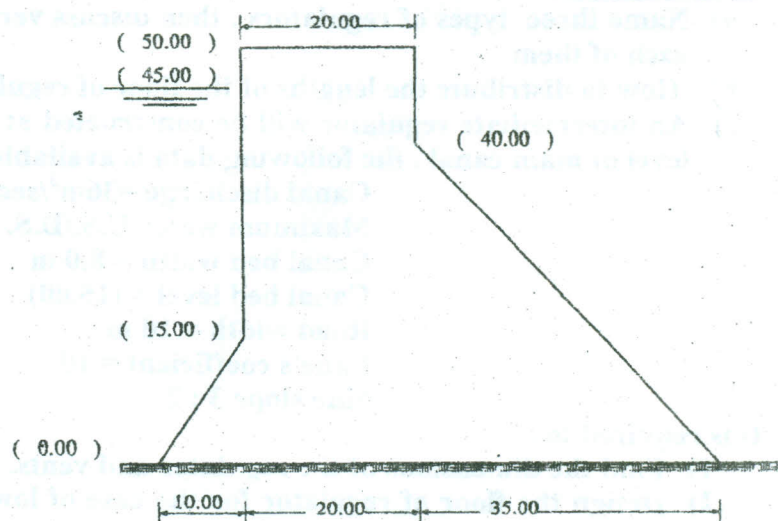
- i. Design the side culvert
- ii. Design the floor (in case of repair) .
- iii. Calculate the stability of thrust wall .
- iv. Calculate the forces exerted on upper and lower pivots of gates of lock (in case of repair) .
- v. Draw a plan and sectional elevation along the center line of the lock

**Question 4: ( 25 marks )**

- a) How dams can be classified ? in general  
State three types as examples .
- b) List the main forces acting on dams .
- c) The figure shows a non-overflow cross-section of a gravity dam. It is required to calculate the stresses of the resultant forces acting on the dam base.

The following conditions should be considered :

- 1- Full reservoir and no tail water.
- 2- Horizontal earthquake acceleration acting upstream with seismic coefficient = 0.15g.
- 3- Vertical earthquake acceleration acting upwards with seismic coefficient = 0.10g.
- 4- Consider uplift pressure.
- 5- Specific gravity of dam material = 2.30 t/m<sup>3</sup>.



Best wishes

Prof. Dr. Mahmoud El-gamal  
Exam Committee