

Kafr El-Sheikh University
Faculty of Engineering
Civil Engineering Department

Fourth Year Civil
Time allowed : 4 Hours
Date: January, 2016

Design of Irrigation Works (II)

- **Systematic calculations and neat sketches are very important.**
- **Any other required data may be reasonably assumed**

الإمتحان مكون من صفتين

Question No. (1): [65%]

An **intermediate** regulator is to be constructed across a main channel according the following data:

- The regulator consists of 3 vents each of span 5m, pier thickness = 1.75m
- The discharge = 80 m³/sec, U.S.W.L & D.S.W.L = (20.50) & (19.50); respectively, bed level = (16.00), **Bligh** coefficient = 14,
- **D.L. & L.L of the bridge = 1.5t/m² & 2.5t/m²; respectively,**
- Spacing between Main girder of the bridge = 2m,
- Bridge width=10m+ 2 side walks each of width = 1m, road level = (23.00).
- The regulator vents are provided with **double gates**, the number of horizontal beams for the **upper** and the **lower** gates are 3 and 4; respectively,
- The pier length **upstream and downstream the bridge** are 5.5 m and 2.50 m; respectively, **sluice well** width = 1.5m.

- a) Design the floor **length** and **depth** to be safe against **scour, undermining and uplift** according to **Bligh** 's theory. [15%]
- b) Check the stability of the pier for the case of max. **normal** force. [15%]
- c) Determine the **positions** and the modulus section (**Z**) of the horizontal beams and the **thickness** of the skin plate of the **lower gate**, $t = ab (P/ 2f (a^2+b^2))^{0.5}$ [20%]
- d) Draw to suitable scale **sec. elevation** of the regulator showing all dimensions and levels. [15%]

(باقي الأسئلة في الخلف)

Question No. (2): [20%]

A symmetric lock has to be constructed according to the following data:

- U.S.W.L. & D.S.W.L.= (10.00) & (9.00); respectively, bed levels U.S. and D.S. = (7.00) and (6.00); respectively, berm level = (11.00), lock length = 150 m, lock width = 14 m, $\gamma_{\text{soil}}(\text{dry}) = 1.8 \text{ t/m}^3$, $\gamma_{\text{soil}}(\text{submerged}) = 1.1 \text{ t/m}^3$, ϕ for soil = 30° , L.L. = 0.6 t/m^2 , $W_g = 0.25 \text{ t/m}^2$, $T = t_o / 2 + 2 A H / (c d a (2gh)^{0.5})$.
- It is required to:

- a) Design the method of filling and emptying the lock. [5%]
- b- Check the stresses at P.C. thrust wall for the **case of repair**. [15%]

Question No. (3): [15%]

- a) Explain briefly the considered factors for selection the dam type. [4%]
- b) Fig.(1) shows P.C. gravity dam, it is required to **calculate the following forces** acting on the dam: [11%]
 - a) Uplift force, b) Silt force where slit depth = 5m, c) Wave force, $h_w = 1\text{m}$.
 - d) force due to vertical earthquake (α_v) = 0.05

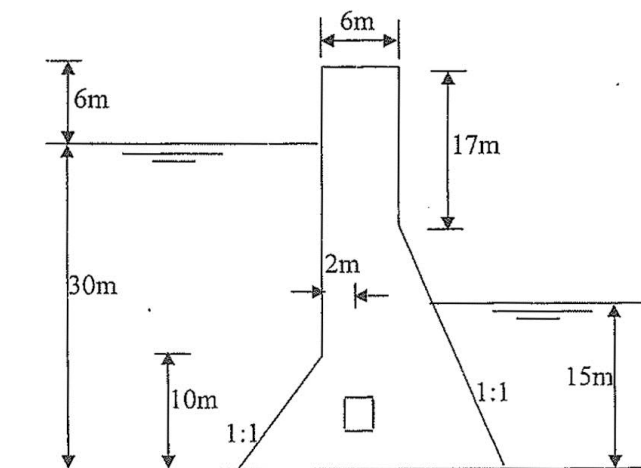


Fig. (1)

GOOD LUCK