Kafr El-Sheikh University	Design of Irrigation Works (II) (CES4124)
Faculty of Engineering	Final term exam.
Civil Engineering Dept.	Date: 31 December, 2018
Fourth Year Civil	Time : 4 hour
Examiner: Associ. Prof. Moustafa El-Enany	Full mark: **100** marks

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

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Question No. (1): [70 marks](A4,A6,b14,B15, C3, C15)

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

- **The regulator consists of 3 vents each of span 6m, pier thickness (P.C.) = 2m,**
- **U.S.H.W.L & U.S.L.W.L = (17.50) & (17.10); respectively, $Q_{max.}$ = 45 m^3/sec**
- **D.S.H.W.L & D.S.L.W.L = (16.50) & (16.20); respectively, $Q_{min.}$ = 34 m^3/sec**
- **The gates are fully closed during low water level,**
- **Bridge (road) level = (20.00), bridge width=10m+ 2 side walks each of width = 1m,**
- **Bed width = 25 m, bed level = (14.50), side slopes =1:1 and 3:2, Berm level = (18.50)**
- **Spacing between main girders of the bridge = 2m, $W_{D.L}$ = 1.5 t/m^2 , $W_{L.L}$ = 2 t/m^2**
- **The regulator vents are provided with double gates for each vent, the main groove dimensions are 0.7m* 0.3m, width of the sluice well (b) = 1.50m,**
- **The gates (upper and lower) are provided with horizontal beams only, numbers of horizontal beams are 2 and 3 for upper and lower gates; respectively,**
- **Bligh coefficient (C_B) = 15, The weight of each of the upper and lower gates (G in ton) may be considered as:**

G (in ton) = 0.07* Span of the vent (in m)* gate area (in m^2),

It is required to:

a) **Check the hydraulic design of the regulator.** **[6 marks]**

a) **Design the floor length and depth to be safe against scour, undermining and uplift according to Bligh's theory.** **[15Marks]**

b) **Check the stability of the pier for the case of max. M_X, where X-axis is parallel to flow direction** **[20 marks]**

c) **Determine the positions and the modulus section (Z) of the horizontal beams and the thickness of the skin plate of the lower gate, $t = ab\,(P/2f\,(a^2+b^2))^{0.5}$** **[11marks]**

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(باقى الأسئلة فى الخلف)

Question No. (1): [continued]

d) Draw to suitable scale **sec. elevation** of the regulator showing all dimensions and levels. [18 marks]

Question No. (2): [25 marks] (A4,A6,b14,B15, C3)

A navigable canal connects navigation between a canal and a drain, Fig. (1), through a lock of dimensions 120m*18m. Canal and drain water levels are (15.25) and 13.25); respectively. Bed levels of canal and drain are (12.00) and (10.00); respectively. It is required to:

a) Design the method of filling and emptying the lock. **[7 marks]**

b- Check the stresses at P.C. thrust wall for the case of operation. **[18 marks]**

$T = to / 2 + 2\,AH / [C_d\, a\, (2\, g\, H)^{0.5}]$, $T = 10min$, $t_o = 1min$, $C_d = 0.62$

Question No. (3): [15 marks] (A4,A6,b14,B15, C3)

a) Explain briefly the considered factors for selection the dam site. [5 marks]

b) Fig.(2) shows **P.C.** gravity dam, it is required to **calculate the following forces** acting on the dam: [10 marks]

a) **Uplift** force, b) **Silt** force where slit depth = 5m, c) **Wave** force, $h_w = 1m$.

d) **force** due to **vertical** earthquake (α_V) = 0.05

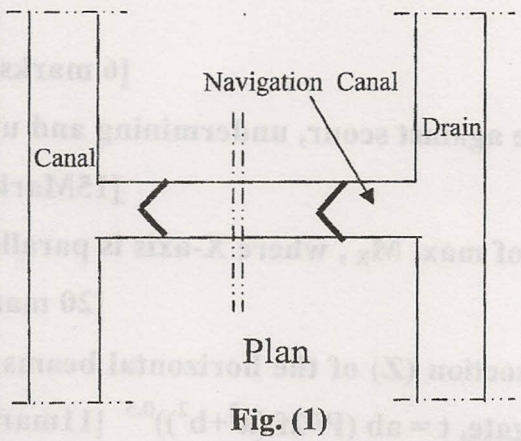

Fig. (1)

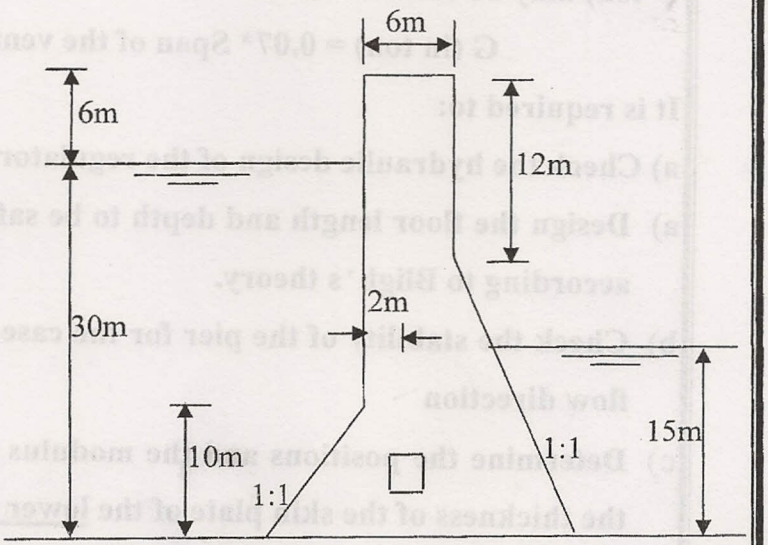

Fig. (2)

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