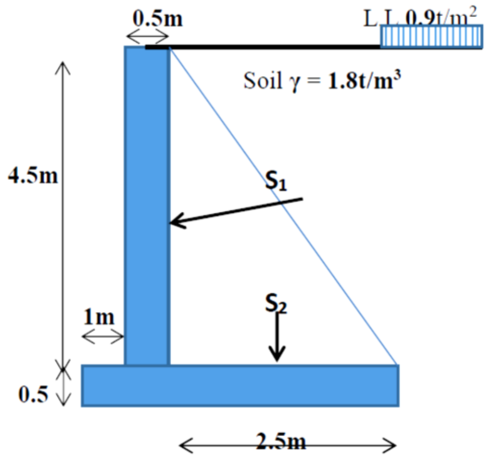
Department: *Civil Engineering* **Level:** *Five* **Final Term Exam** **Semester:** *Second (Spring)* **Regulation:** *Credit Hours* **Course title:** *Design of Irrigation Works* **Course code:** *CIE504*	**Ministry of Higher Education** **The Higher Institute of Engineering and Technology, New Damietta**	**Date:** *17/6/2023* **Day:** *Saturday* **Time allowed:** *3.0 Hrs* **Full marks:** *60 Marks* **Number of Pages:** *2 pages*

- **Answer all the questions.**
- **Net sketch drawings are required.**
- **Any missing data can be reasonably assumed.**

Question (1): *(13 Marks) (c2-a2, c11-a2, c13-c1)*

For the Counterfort wall shown in the figure, **Check the overall stability of the wall and design S_1 and S_2 slabs (Calculate area steel only).**

(spacing of counterfort = **3m**), F_{all} for the soil **14**t/m^2 , $\Phi = 30^o$ L.L **0.9**t/m^2, γ = **1.8**t/m^3



Question (2): *(17 Marks) (c2-a2, c11-a2, c13-c1)*

a- State different uses of **weir** structures and their main types (use sketches).

b- A R.C. Bridge (Slab with main girder type) consists of **two vents** is supposed to be constructed at the site of intersection between main road and a channel. The following data are available: The width of one vent is **7.5 m** and the width of the pier is **1.5m**

• **Data for the Roadway**:- Roadway width = 8.00 m - Bank level = (10.00) - Side slope = 2:1 - Berm level = (8.00)

• **Data for the Channel:**- Bed level = (4.00) - Berm level = (8.00)- Bank level = (10.00) - Bed width = 16.5 m - Side slopes are 1:1 & 2:1

-**Data for the Bridge**:- Bridge width (excluding sidewalks) =**8.00 m** - Sidewalk width = **2.00 m**-- Spacing between Girders = **2.00 m**-- Concentrated live load = **20-ton lorry** - Pedestrian live load = **500 Kg/m^2** -

It is required to:

1. Design the R.C. slab of this bridge.
2. Design the sidewalk of the bridge.
3. Calculate the values of moment and shear for the main girder

Good Luck Prof Yasser Hamed

Question (3): *(22 Marks) (c2-a2, c11-a2, c13-c1)*

I - A R.C. 2 vents culvert is to be constructed to pass the flow of a canal under a highway. The available data for the design are:

Canal date: - Bed width = 4.0 m, - Bed level = (10.00) m, - Water level = (11.90)m - Berm level = (12.50) - Berm width = 5.00 m - Bank level = (14.00) m - Bank width = 10.0 m, - Inner side slope = 2:1, - Outer side slope = 2:1.

Road data: - Side slope of road = 2:1, - Road width = 10.0 m, - Land level = (14.50) m.

Max. canal discharge = 9 m^3/s, Inlet and outlet wing walls are box type, Screen angle = 60^o, Bars diameter = 2.5 cm and distance between bars = 30 cm.

If the heading up not exceeds 20 cm, the moving load is supposed to be 3.0 t/m^2 and γ_{bulk} for soil = 1.7 t/m^3, it is required to:

1 - Calculate the actual velocity through the Culvert and the actual Heading up. *(4 Marks)*

2 - Calculate the total vertical and horizontal loads on the culvert cross section. *(7 Marks)*

II - It is required to construct a steel pipe syphon at the crossing of canal and drain according the following data:

	Bed level	H.W.L.	Berm level	Bank level	Bed width	Bank width	Inner slope	Outer slope
Canal	(11.50)	(13.90)	(14.50)	(16.00)	12.0	10.0	3:2	3:2
Drain	(10.00)	(11.65)	(14.00)	(15.00)	7.0	8.0	3:2	3:2

Max. drain discharge = 7.8 m^3/s, Inlet and outlet wing walls are box type, Screen angle = 60^o, Bars diameter = 2.5 cm and distance between bars = 30 cm.

If the No. of vents is 3, the diameter of the pipe is 1.5 m and the heading up not exceed 20 cm, it is required to:

1 - Specify if the syphon will be straight or bending, also is the type of walls at inlet and exit will be box type or broken? *(4 Marks)*

2 - Calculate the actual velocity through the syphon and the actual Heading up. *(4 Marks)*

3 - Calculate the thickness of the pipe and then check the stress for the internal pressure force only. *(3 Marks)*

Question (4): *(8 Marks) (c2-a2, c11-a2, c13-c1)*

1 - Explain briefly with neat sketches, how to operate the lock? *(2 Marks)*

2 – What is the type of failures of dams? discuss briefly the environmental impacts of dams. *(2 Marks)*

3 - The table below gives the inflow hydrograph for a river with max. reservoir storage = 1200 Mll m^3. The water demand is 600 Mll m^3/year. It is required to determine the total volume of water that will be spilled out over the given years. *(4 Marks)*

Year	**2001**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**
Inflow Mllm^3/year	**622**	**585**	**743**	**1055**	**1315**	**763**	**986**	**358**	**514**	**826**	**1012**	**756**	**1387**	**516**	**597**

Best wishes

Prof. Dr. Mohamed Elkiki