Menoufiya University

Faculty of Engineering Shebin El-Kom

Civil Engineering Department

Minufiya University

Diploma Exam  13 / 01 / 2018

Hydraulic structures ( CVE552)

Time allowed 3 hrs

Max. Degree : 100

**Answer the following questions . Any missing data can be reasonably assumed . Illustrates you answer with neat sketches . answers should be organized , concise and readable.**

## Question ( 1 ) ...................................................................( 35 MARKS )

An intersection between a canal and a road occur at a certain location at which the canal cross section is as shown below in figure, while the road intersected with the canal was first class road with 12.00m width, it is required to design the suitable bridge at this crossing if:

The discharge through the canal was 100 $m^3$/sec.
Live load is lorry system of 60 ton.
Uniform distributed load = 500 kg/$m^2$.
The soil at the crossing site is found to be silty sand with max allowable bearing capacity of 12.50 t / $m^2$.



(20.75)

(19.75)     2:1          2:1   (19.75)

(19.00)                        12.00

(15.00)                1:1

16.00
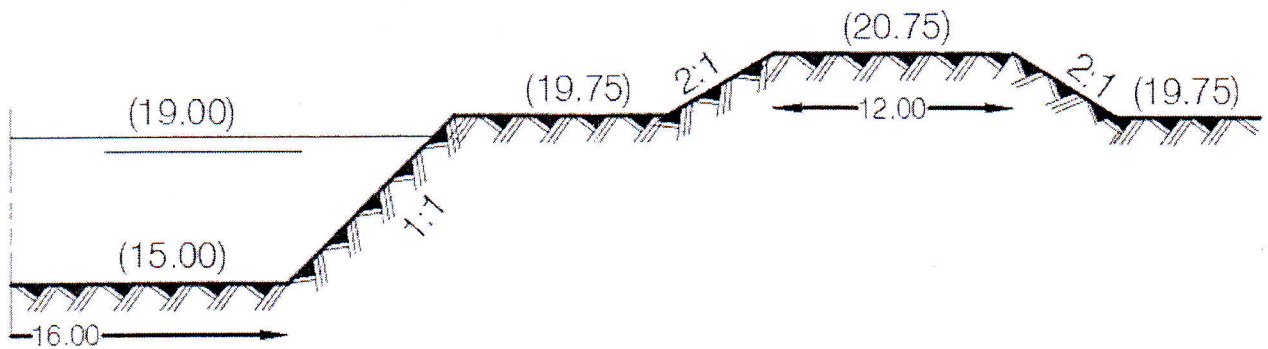
Cross section of the canal

**It's required to:**

    A. Fix the number of vents and the span of each vent ................................... ( 10marks)
    B. Check the heading up, and water way..................................................(10 marks)
    C. Draw the different elements of the bridge ...............................................(10 marks)
    D. Draw necessary views of the bridge....................................................( 5 marks )

## Question ( 2) .................................................................…...( 35 MARKS )

For the shown drain cross section, it is required to construct a R.S.J. bridge on screw piles using the following data:

Roadway over bridge = 6.00 m, two foot path each = 1.00 m, moving load = 20 ton lorry, intensity of uniformly distributed L.L= 600 kg/$m^2$, maximum span of girders between screw piles = 6.00 m, impact coefficient = 20% , floor consists of wearing planks 5x25 cm, timber joists 25x25 cm, diameter of steel pipe = 30 cm, diameter of disc of screw pile = 110 cm. Materials to be used:

**For timber:** allowable bearing stresses = 80 kg/$cm^2$, allowable shear stresses = 16 kg/$cm^2$.

**For steel:** allowable bending stresses = 1200 kg/$cm^2$, allowable shear stresses = 840 kg/$cm^2$.

Drain cross section



20 ton lorry
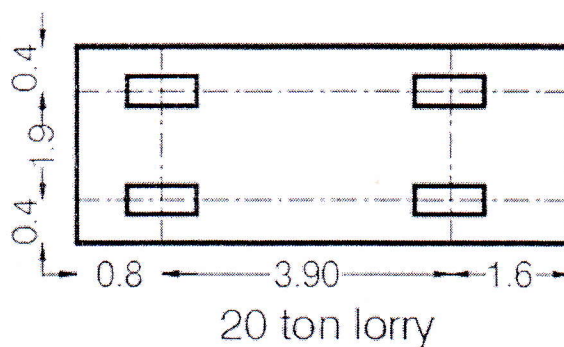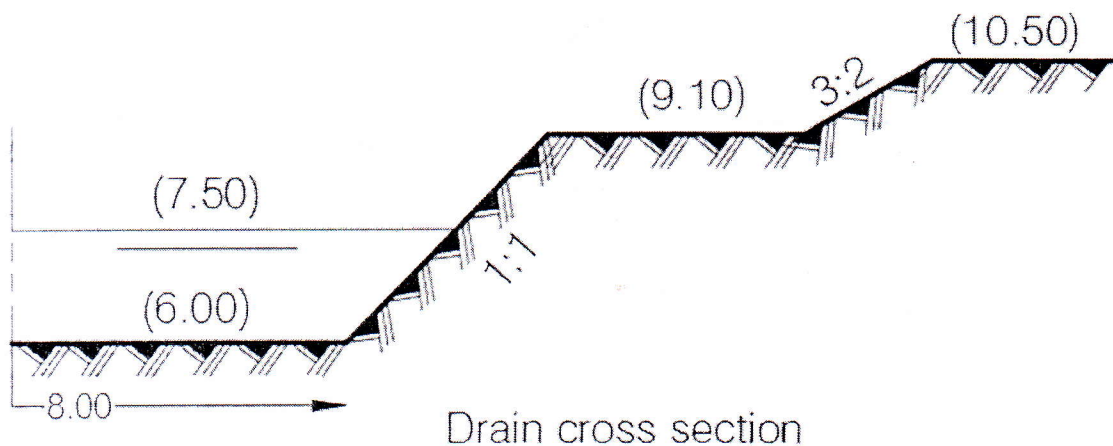
## Question ( 3 ) ...........................................................................( 30 MARKS )

For an intermediate regulator constructed on the main canal having the following data:

|  | U.S of regulator | D.S of regulator |
|---|---|---|
| H.W.L | (17.85) | (17.20) |
| L.W.L | (17.70) | (16.25) |
| Canal bed level | (14.00) | (13.20) |
| Bed width | 16.0 m | 16.0 m |
| Side slope | 3:2 | 2:1 |

- The surface water slope in the canal = 8 cm /km
- Manning's coefficient = 40

## It's required to:

A. Make hydraulic design of regulator.................................................( **5 marks** )
B. Design the floor of the regulator using bligh theory($c_B$=15, $c_S$= 8)..............(**10 marks**)
C. Draw and calculate the case of loading to check the stability of the pier (DL = 3 ton/girder &LL = ton/girder)...................................................................(**10 marks**)
D. Design the gate thickness of the regulator.......................................( **5 marks** )

| This exam measures the following ILOs | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Question Number | Q1 | Q2 | Q3 | Q1 | Q2 | Q3 | Q1 | Q2 | Q3 | |
|  | a2 | | | b5 | b6 | b12 | c9 | c11 | c4 | |
| | Knowledge & Understanding Skills | | | Intellectual Skills | | | Professional Skills | | | |