

## EAH 225 HYDRAULICS

### Open Channel Flow Assignment

Due Date: 29th MAY 2012 (TUESDAY)

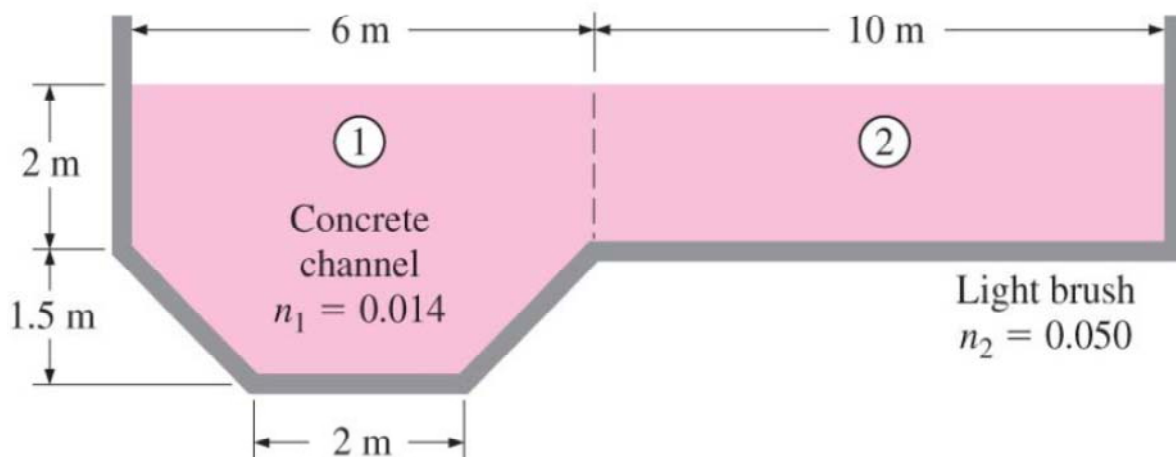
1. A trapezoidal channel made of unfinished concrete (see **Table 1**) has a bottom slope of 0.0174, base width of 5 m, and a side slope of 1:1. For a flow rate of 25 m<sup>3</sup>/s, determine the normal depth.

(5 Marks)

2. A clean-earth trapezoidal channel (see **Table 1**) with a bottom width of 1.8 m and a side slope of 1:1 is to drain water uniformly at a rate of 8 m<sup>3</sup>/s to a distance of 1 km. If the flow depth is not to exceed 1.2m, determine the required elevation drop.

(5 Marks)

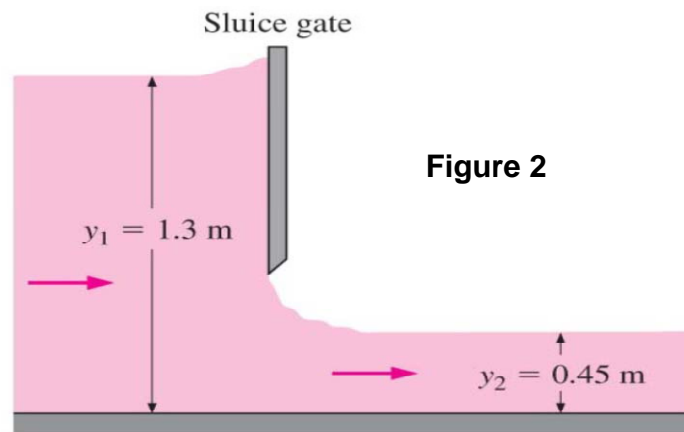
3. Water flows in a channel whose bottom slope is 0.002 and whose cross section is as shown in **Figure 1**. The dimensions and the Manning coefficients for the surfaces of different subsections are also given on the figure. Determine the flow rate through the channel.



**Figure 1**

(10 Marks)

4. The flow rate of water through a 8-m wide rectangular channel is controlled by a sluice gate (**Figure 2**). If the flow depths are measured to be 1.3 m and 0.45 m upstream and downstream from the gates, respectively, determine the flow rate and the Froude number downstream from the gate if the frictional effects are negligible.



**Figure 2**

(10 Marks)

**Table 1**

Mean values of the Manning coefficient  $n$  for water flow in open channels\*

*From Chow (1959).*

Wall Material	$n$
<b>A. Artificially lined channels</b>	
Glass	0.010
Brass	0.011
Steel, smooth	0.012
Steel, painted	0.014
Steel, riveted	0.015
Cast iron	0.013
Concrete, finished	0.012
Concrete, unfinished	0.014
Wood, planed	0.012
Wood, unplanned	0.013
Clay tile	0.014
Brickwork	0.015
Asphalt	0.016
Corrugated metal	0.022
Rubble masonry	0.025
<b>B. Excavated earth channels</b>	
Clean	0.022
Gravelly	0.025
Weedy	0.030
Stony, cobbles	0.035