Menoufia University
Faculty of Engineering, Shebin El-Kom
Civil Engineering Department

Diploma Exam 4/6/2018
Open Channel Hydraulics (CVE 558)
Time allowed : 3hrs
Max. degree : 100

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

Question (1) ..... (21 MARKS)

1.) An earth channel is lined with concrete (n=0.015) has side slopes 1:1.5 and is tangent to a 3.0 ft radius of the bottom, and is laid on a slope of 0.0038. Find the depth of uniform flow for a discharge of 300 cfs. ..... (9 marks)

2.) Show that the maximum velocity in a circular open channel of a certain diameter takes place when the water depth is 0.81 times the channel diameter. Also show that the maximum discharge occurs when the water depth is 0.95 the diameter. ..... (12 marks)

Question (2) ..... (24 MARKS)

1.) For uniform laminar flow in wide open channels that:

a.) The velocity distribution at vertical section is parabolic, ... (3marks)

b.) the average velocity : $v = \frac{g.s}{3\nu} . y_o^2$, ... (3 marks)

c.) the unit discharge : $q = \frac{g.s}{3\nu} . y_o^3$, ... (3 marks)

and then evaluate the values of the velocity coefficient α and the momentum coefficient β.

(3 marks)

2.) Estimate the maximum shear stress on both the sides and the bottom of a trapezoidal open channel if : b=4y=20m, n=0.017, z=1.5, s_o=10cm/km, d_{50}=2.30 mm, γ_s=2.60 t/m^3, and angle of repose (θ=35°)

show how to check the stability of the hydraulic section, calculate the shear velocity. (12 marks)

Question (3) (25 MARKS)

1.) A rectangular channel 10ft wide carries a flow rate of 500 cfs. Uniformly at 2.0 ft. The channel is constricted at the end to produce a hydraulic jump in the channel. Calculate the width of constriction for the jump to be just upstream from constriction. ..... (6 marks)

2.) A uniform flow of 22 m^3/s occurs in a rectangular channel of 4.8 ms width and 2.30 ms water depth. The channel bed is gradually contracted to a width of 3.5 ms find:

a.) The difference in water levels just before and at the constriction, ... (5 marks)

b.) The width of contraction to produce critical depth on it, and the drop in water levels, (5 marks)

c.) Draw relationship between y_1,y_2 versus b_2, ... (4 marks)

d.) The differences in water levels if the width is contracted to 1.6 ms ..... (5 marks)

Question (4) **(30 MARKS)**

1.) A hump of height (Δz) is designed to create critical flow condition and is installed in a rectangular channel. The depth of the approaching flow is (y_1), draw the relationship between ($y_1/\Delta z$) and F_1. Also determine the values of the Froude number of the incoming flow so that($\Delta z > y_1$) (12 marks)

2.) A lined trapezoidal channel with manning coefficient (n=0.014) is to carry $100 m^3/sec$. Discharge with channel bed slope 0.000312. If the side slopes of the channel has an angle 70° with the horizontal. Determine channel dimensions if it is to be designed as the most efficient channel section. (12 marks)

3.) sketch the water surface profile for the following cases:

a.) a hump with subcritical flow (Q,b are constants) (2 marks)

b.) Enlargement supercritical flow (Q= constant) (2 marks)

c.) Sump with sub critical flow (Q,b are constants) (2 marks)

Good Luck

This exam measures the following ILOs											
Question Number	Q4-1			Q1-2	Q2-1	Q2-2	Q1-a	Q2-2	Q3-2	Q4-2	Q4-3
Skills	a2			b5	b6	b12	c9	c11	c4	c1	c6
	Knowledge &Understanding Skills			Intellectual Skills			Professional Skills				