MACHAKOS UNIVERSITY

University Examinations 2016/2017

SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

SECOND YEAR FIRST SEMESTER EXAMINATION FOR BACHELOR OF SCIENCE IN CIVIL ENGINEERING

SUPPLEMENTARY EXAMINATION

ECV 302: HYDRAULICS I

DATE: 29/8/2017 **TIME: 2:00 – 4:00 PM**

INSTRUCTIONS

This paper contains **Four** questions attempt *question **One** and any other **Two***

1. a) Define the following terms as used in open channel hydraulics

   i. Uniform flow (2 marks)

   ii. Unsteady varied flow (2 marks)

   iii. Critical depth (2 marks)

   iv. Hydraulic radius (2 marks)

   v. Wetted perimeter (2 marks)

   b) Enumerate the practical application of hydraulic jump in open hydraulics (7 marks)

   c) Water is to flow at a rate 30 m3/s in a concrete channel shown in Figure 1C. Find the required vertical drop of the channel bottom per a kilometre of length. (13 marks)

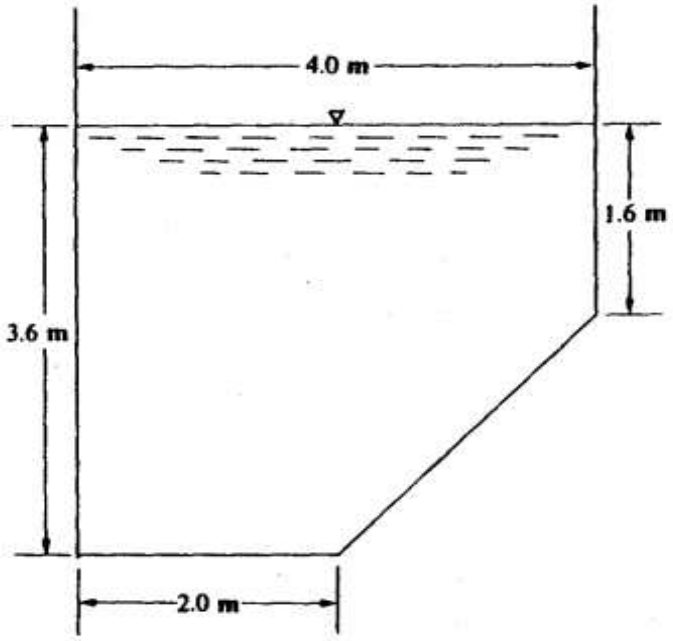

Figure 1b

d) Water flows in rectangular, concrete, open channel that is 12.0 m wide a depth of 2.5 m. The slope is 0.0028. Find the water velocity, flow rate and Reynolds number. Take n = 0.015 (10 marks)

2. a) Describe specific energy and specific force (5 marks)

b) A trapezoidal canal with side slopes 2:1 has a bottom width of 4 m and caries a flow 23 m3/s. Calculate the critical depth. (10 marks)

3. a) What do you understand by most efficient channel section (5 marks)

b) Find the discharge in Figure 3b, if the slope is 0.00015 and Manning's n is 0.02. (10 marks)

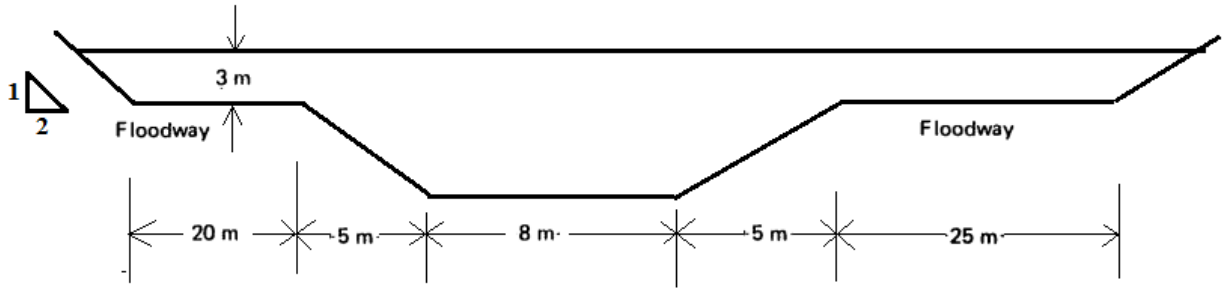

Figure 3b: Channel cross sectional

4. a) Differentiate between sub-critical flow and super-critical flow in open flow hydraulics (5 marks)

b) A wide rectangular depth excavated from the earth has a discharge of 5 m3/s per m. Determine the minimum specific energy. (10 marks)

5. a) Highlight the two parameters that must be ascertained before determining flow profiles (5 marks)

b) For a rectangular channel of width 20 m, determine the critical bed slope and discharge for critical depths of 0.20, 0.60, and 1.6 m. Assume n = 0.035. (10 marks)