TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR BACHELOR OF SCIENCE IN CIVIL ENGINEERING (BSCE)

ECE 2305: HYDRAULICS I

END OF SEMESTER EXAMINATION
SERIES: APRIL 2013
TIME ALLOWED: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
- *Answer Booklet*

This paper consists of **FIVE** questions.
Answer question **ONE (COMPULSORY)** in section **A** and any other **TWO** questions from section **B**
Maximum marks for each part of a question are as shown
This paper consists of **TWO** printed pages

SECTION A

Question One (Compulsory)

a) Define critical depth and give the equation that is used to calculate critical depth. **(5 marks)**

b) Define normal depth **(2 marks)**

c) Define unsteady flow in channels **(2 marks)**

d) A rectangular channel section of width 1m carries a flow of $0.3 \text{m}^3/\text{s}$.

    (i) Assuming Chezy coefficient of 55 and slope of 0.002, estimate the depth of uniform flow.
    (ii) Assuming the effective surface roughness height of 3.17mm and slope of 0.002, estimate the depth of uniform flow. **(10 marks)**

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e) A rectangular section channel conveys 2.5m^3/s flow with a bed slope of 0.002. Determine the best hydraulic section dimensions if:
   (i) The effective surface roughness height is 3mm
   (ii) The manning roughness coefficient is 0.014 **(11 marks)**

SECTION B (Attempt any TWO questions)

Question Two

Calculate the normal flow depth in a trapezoidal channel with side slopes in 1.5, bottom width 7.6m and
$$n = 0.0\hat{2}$$
channel slope 0.0088, and if the discharge is 42m^3/s and manning's . **(20 marks)**

Question Three

a) Show that for a circular culvert of Diameter D the velocity of flow will be a maximum when the depth of flow h at the centre is 0.81D. **(15 marks)**

b) A sewer diameter D = 0.6m has a slope S_o of 1 in 200.
   (i) Calculate the maximum velocity of flow that can occur, and **(3 marks)**
   (ii) Discharge at this velocity **(2 marks)**
   (iii) Discharge at this velocity. **(2 marks)**

Question Four

A rectangular sharp-crested weir is to be constructed in a testing station with small stream in which the discharge varies from 50 litre/s and 1250l/s. Calculate the suitable length of weir, if the minimum head to be measured is 50mm and the maximum head on it does not exceed 1/3 of its length.

(20 marks)

Question Five

a) Determine the dimensions of force, pressure, power, specific width and surface tension in M-L-T system. **(10 marks)**

b) Check the dimensional homogeneity of the following common equation in the field of Hydraulics. **(5 marks)**

c) A rectangular notch 0.5 metres wide has a constant head of 400mm. calculate the discharge over the notch in l/s if the coefficient of discharge for the notch is 0.62 **(5 marks)**