TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN CIVIL ENGINEERING

(INSTITUTION BASED EXAMINATION)

ECE 2304 : HYDRAULICS

END OF SEMESTER EXAMINATION

SERIES: MARCH 2017

TIME: 2 HOURS

DATE: 26 Mar 2017

<u>**Instructions to Candidates**</u>
You should have the following for this examination
 -Answer Booklet, examination pass and student ID
This paper consists of five questions.
Attempt question ONE (Compulsory) and any other TWO questions.
Do not write on the question paper.

QUESTION ONE (COMPULSORY)
   a) Define an open channel. (3 Marks)
   b) A rectangular channel is 1.5m deep and 6m wide. Find the discharge through the channel when it runs full. S_o=1 in 900 and C=50. (8 Marks)
   c) Water is flowing at the rate of 16.5m^3/s in an earthen trapezoidal channel width 9m, water depth 1.2m and side slope 1:2. Calculate the bed slope. C=49.5. (8 Marks)
   d) An earthen channel with a 3m wide base and side slopes 1:1 carries water with a depth of 1m. The bed slope is 1 in 1600. Estimate the discharge. N=0.04. (11 Marks)

Attempt any TWO questions
QUESTION TWO
   a) Define the following terms:
       i)   Normal depth
       ii)   Turbulent flow

iii)   Specific gravity
iv)   Laminar flow
v)   Critical depth   (5 Marks)
b) Calculate the most economical cross-section of a rectangular channel to carry $0.3m^3/s$ when bed slope is 1 in 1000, assume Chezy's C=60. (7 Marks)
c) A trapezoidal channel having side slopes of 1:1 and bed slope of 1 in 1200 is required to carry a discharge of $180m^3/min$. find the dimensions of the channel for minimum cross section. C=50. (8 Marks)

Attempt any TWO questions
QUESTION TWO
Describe the method of solving problems of non-uniform flow. (20 Marks)

QUESTION THREE
a) A rectangular section channel conveys $2.5m^3/s$ flow with a bed slope of 0.0002. determine the best hydraulic section dimensions if:
i)   The effective surface roughness height is 3mm
ii)   The manning roughness coefficient is 0.014
        (10 Marks)

QUESTION FOUR
a) A rectangular channel section of width 1m carries a flow of $0.3 m^3/s$
i)   Assuming Chezy coefficient of 55 and slope of 0.002, estimate the depth of uniform flow.
ii)   Assuming the efficient surface roughness height of 3.17mm and slope of 0.002, estimate the depth of uniform flow. (5 Marks)

QUESTION FIVE
a) Outline the procedures for model analysis. (3 Marks)
b) The discharge over a model which is reduced to 1:100 in all its dimensions is 1.5l/s. What is the corresponding discharge in the prototype? (5 Marks)
c) Show that the resistance (R) to the motion of a sphere of diameter (D) moving with a uniform velocity (V) through a real fluid having mass density (ρ) and viscosity (μ) is given by

$$R = \rho V^2 D^2 f(\frac{\mu}{\rho VD})$$