



TECHNICAL UNIVERSITY OF MOMBASA
**Faculty of Engineering &
Technology**

DEPARTMENT OF BUILDING & CIVIL ENGINEERING
**DIPLOMA IN BUILDING & CIVIL ENGINEERING (DBCE 11)
DIPLOMA IN CIVIL ENGINEERING (DC 11)**

EBC 2309: HYDRAULICS

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: OCTOBER 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 any **THREE** questions

Maximum marks for each part of a question are as shown

This paper consists of **THREE** printed pages

Question One

- a) The open channel in figure 1 is discharging water at a rate of 42.5l/s. If Chezy's $C = 49$, determine the slope of the channel **(12 marks)**

Figure 1

- b) Define the following types of flow:

- (i) turbulent
- (ii) laminar
- (iii) non uniform
- (iv) uniform

(8 marks)

Question Two

- a) Water is flowing through the channel shown in figure 2 at a rate of $0.55\text{m}^3/\text{s}$. If the bed slope is 1:2500, determine the value of Chezy's C **(10 marks)**

0.3m

- b) A rectangular channel is to be designed to convey water at a rate of $50\text{m}^3/\text{s}$. If Chezy's $C = 50$, and the bed slope is 1:1000, determine the best dimensions of the channel. **(10 marks)**

Question Three

- a) A concrete lined channel 3m diameter has a slope of 1:500. If Chezy's $C = 50$. Determine:

- (i) Maximum velocity
- (ii) Maximum discharge

(10 marks)

- b) A rectangular channel is to be designed to convey water at a rate of $50\text{m}^3/\text{s}$. If Chezy's $C = 50$, and the bed slope is 1:1000, determine the best dimensions of the channel. **(10 marks)**

Question Four

- c) A channel of rectangular section 2m wide is discharging water at a rate of $3\text{m}^3/\text{s}$ with an average velocity of 1.2m/s. Determine:
- (iii) The normal depth
 - (iv) Specific energy of flowing liquid
 - (v) The critical depth
 - (vi) The critical velocity **(10 marks)**
- d) A venture flume is 0.65m at the entrance and 0.33m at the throat. The depths at the entrance and throat are 0.65m and 0.6m respectively. Neglecting hydraulic losses in the flume determine the discharge **(6 marks)**
- e) Write the expression for calculating Froude's number and state its values for subcritical, critical and supercritical flow **(4 marks)**

Question Five

- a) Define the following hydraulic machines:
- (i) Compressor
 - (ii) Pump
 - (iii) Turbine **(6 marks)**
- b) State **TWO** functions of an air vessel when fitted on the delivery side of a reciprocating pump **(4 marks)**
- c) With the aid of a sketch, briefly describe the operating principle of a single acting reciprocating pump **(10 marks)**