



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

DEPARTMENT OF BUILDING & CIVIL ENGINEERING
HIGHER DIPLOMA IN BUILDING & CIVIL ENGINEERING (HDBCE 12S)

EBC 3120: HYDRAULICS

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 any **THREE** questions

Maximum marks for each part of a question are as shown

This paper consists of **THREE** printed pages

Question One

a) Define the following types of flow:

- (i) Turbulent flow
- (ii) Laminar flow
- (iii) Uniform flow

(6 marks)

b) A trapezoidal channel with sides sloping at 45° , conveys water at a rate of $1.2\text{m}^3/\text{s}$ with a mean velocity of 0.8m/s . The water depth is 0.75m and Chezy's $C = 66$. Determine:

- (i) The width of the base
- (ii) The bed slope

(14 marks)

Question Two

a) A triangular open channel with an included angle of 60° has a water depth of 0.25m as shown in figure 1. If the discharge is $0.04\text{m}^3/\text{s}$ and Chezy's $C = 52$, determine the bed slope. **(7 marks)**

Figure 1

b) An open channel with a semicircular bottom and vertical sides is shown in figure 2. If the discharge is $6.3407\text{m}^3/\text{s}$ and the bed slope is $1:2000$, determine:

- (i) Chezy's C
- (ii) Mannings n

(13 marks)

1.5m radius

Question Three

a) A 2m diameter pipe is laid with a bed slope of $1:1000$ chezy's $C = 60$. Determine:

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

(10 marks)

b) A rectangular channel has a cross-section of 8m^2 and a bed slope of $1:1000$.

Chezy's $C = 55$. Determine:

- (i) The best dimensions
- (ii) The discharge through this section **(10 marks)**

.Question Four

- a) A channel of rectangular section is 8m wide and discharging water at a rate of $1.2^3\text{m}^3/\text{s}$ with an average velocity of 1.2m/s. Determine;
- (i) The normal depth
 - (ii) Specific energy of the flowing liquid
 - (iii) The critical depth
 - (iv) The critical velocity
 - (v) Whether flow is critical, subcritical or supercritical. **(12 marks)**
- b) A rectangular channel 6m wide discharges $1.44\text{m}^3/\text{s}$ of water into a 6m wide apron with no slope with a mean velocity of 6m/s as shown in figure 3. Determine:
- (i) The height of the hydraulic jump
 - (ii) The energy absorbed by the jump **(8 marks)**

Figure 3

Question Five

- a) Differentiate the following:
- (i) Pump
 - (ii) Blower/fan
 - (iii) Turbine **(6 marks)**
- b) (i) Briefly describe the **TWO** broad classification of pumps.
(ii) Give **TWO** examples of EACH class of pump in Q 4 b (i) **(8 marks)**
- c) State **FOUR** advantages and **TWO** disadvantages of a centrifugal pump when compared to a reciprocating pump. **(6 marks)**