



# THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

*Faculty of Engineering and Technology*

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

DIPLOMA IN CIVIL ENGINEERING

**EBC 2320: HYDRAULICS**

END OF SEMESTER EXAMINATIONS

**SERIES: AUGUST/SEPTEMBER 2011**

**TIME: 2 HOURS**

**Instructions to Candidates:**

You should have the following for this examination

- *Answer booklet*

This paper consists of **FIVE** questions in **TWO** sections **A & B**

Answer question **ONE (COMPULSORY)** and any other **TWO** questions

Marks are indicated for each part of the question

This paper consists of **THREE** printed pages

## SECTION A (Compulsory – 30 Marks)

### Question 1

- a) Define the following types of flow:
- (i) Steady uniform
  - (ii) Unsteady uniform
  - (iii) Turbulent
  - (iv) Laminar
- (8 marks)
- b) A rectangular channel has a width of 4.5m and a bed slope of 1:800 chezy's  $c = 49$  and depth of floor 1.2m. Find;
- (i) Mean velocity of flow
  - (ii) Discharge in the channel
- (6 marks)
- c) A channel has vertical walls 1.2m apart and a semicircular invert 0.6m radius. The centre line depth is 0.9m and bed slope is 1:250. If the discharge is  $0.55\text{m}^3/\text{s}$ , determine chezy's  $C$
- d) Define the following terms.
- (i) Specific energy
  - (ii) Critical flow
  - (iii) Pump
- (6 marks)

## SECTION B (Compulsory – 40 Marks)

### Question 2

- a) A sewer 0.6m diameter has a bed slope of 1:200 and Chezy's  $C = 55$ . Determine:
- (i) Maximum velocity in the sewer
  - (ii) Maximum discharge in the sewer
- (11 marks)
- b) It is required to excavate a canal out of rock with Chezy's  $C = 82.5$ . The canal is rectangular and is convey  $14.2\text{m}^3/\text{s}$  of water with a velocity of  $2.25\text{m}/\text{s}$ . Determine;
- (i) The best dimensions of the canal
  - (ii) The gradient of the canal
- (9 marks)

### Question 3

- a) A channel of rectangular section 8m wide has water flowing at a depth of 1.25m with a velocity of  $1.2\text{m}/\text{s}$ . Determine the type of flow based on the depth of flow
- (7 marks)
- b) A horizontal rectangular channel of constant breadth has a sluice opening upwards. When the sluice is partially opened, water issues at  $6\text{m}/\text{s}$  with a depth of 600mm. Determine the loss of head due to hydraulic jump
- (11 marks)

- c) With reference to Froude's number, distinguish streaming flow from shooting flow (2 marks)

#### Question 4

- a) A venturiflume is 1.30m wide at the entrance and 0.65m at the throat. Neglecting hydraulic losses in the flume, calculate the flow if depths at the entrance and throat are 0.65m and 0.6m respectively. (5 marks)
- b) The normal depth of flow of water is 1m in a rectangular channel 1.5m wide. The bed slope of the channel is 0.0006 and Manning's  $n = 0.012$ . Determine the critical depth (9 marks)

#### Question 5

- a) with the aid of a sketch, briefly describe the working principle of a double acting reciprocating pump (8 marks)
- b) sketch a Pelton wheel and briefly explain its working principle (8 marks)
- c) explain **TWO** functions of an air vessel when placed on the delivery side of reciprocating pump (4 marks)