



TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF ENGINEERING AND TECHNOLOGY

Department of BUILDING & Civil engineering

UNIVERSITY EXAMINATION FOR:

BACHELOR OF TECHNOLOGY IN CIVIL ENGINEERING

TCV 4326 : HYDRAULICS I

END OF SEMESTER EXAMINATION

SERIES: AUGUST 2024

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **four** questions.

Attempt **question ONE (Compulsory) and any other TWO questions.**

Do not write on the question paper.

QUESTION ONE

- a) Define the normal depth of a channel and give the formula for obtaining the normal depth. **(6 marks)**
- b) Define critical depth of an open channel and show how is determined mathematically. **(6 marks)**
- c) (i) A discharge of $4.5 \text{ m}^3/\text{s}$ occurs in a rectangular channel 1.83m wide with $S = 0.002$ and $n = 0.012$. Calculate the normal depth for uniform flow and determine the critical depth. **(6 marks)**

(ii) Determine whether the flow is subcritical or supercritical. **(2 marks)**

QUESTION TWO

- a) Briefly explain Froude number. **(2 marks)**
- b) Briefly explain Froude's number importance in hydraulics. **(4 marks)**
- c) Write the specific energy loss formula for the hydraulic jump and summarize its occurrence. **(6 marks)**
- d) Briefly explain the basic assumptions in the derivation of gradually varied flow. **(6 marks)**

QUESTION THREE

- a) Derive the equation of generally varied flow and describe the equation. **(8 marks)**
- b) State the effect of a local rise in the bed level on the flow of water. **(8 marks)**
- c) A broad – crested weir 20m long is discharging water from a reservoir into a channel. Calculate the discharge over the weir, if the head of head of water on the upstream and downstream sides is 1m and 0.5m respectively. Take coefficient of discharge for the flow as 0.6. **(4 marks)**

QUESTION FOUR

- a) Define specific energy of a flowing liquid. **(2 marks)**
- b) A channel of rectangular section 8m wide is discharging water at the rate of 12 m³/s with an average velocity of 12 m/s. Determine the type of flow. **(8 marks)**
- c) A rectangular channel of 3m wide and laid to a slope of 0.0009 carries water at a depth of 1.5m. assuming Manning's (N) as 0.015 and flow to be uniform. Calculate the maximum height of hump to produce critical depth. **(10 marks)**