



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

Department of BUILDING & Civil engineering

UNIVERSITY EXAMINATION FOR: BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECV4509 : HYDRAULICS II

END OF SEMESTER EXAMINATION

SERIES: APRIL 2025

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 five questions.

Attempt question ONE (Compulsory) and any other TWO questions

Do not write on the question paper.

QUESTION ONE - COMPULSORY

- a) Define Newtons law of resistance (2 Marks)
- b) This law is based on assumptions. Enumerate three of them (5 marks)
- c) Outline the coefficient whose value depends upon the type of plate and angle of inclination of the plate (6 marks)
- d) Describe the boundary layer which has its velocity equal to zero. (3 marks)
- e) Write short notes on lift and drag. (4 marks)

- f) A plate is held on path of flowing water which has a uniform velocity of 3m/s. Find the distance from the leading edge of the plate at which the laminar flow will break. Also find the thickness of the boundary layer at this point. Take kinematic viscosity of water as $0.01 \times 10^{-4} m^2/s$ (10 marks)

QUESTION TWO

- a) What do you understand by the term thickness of boundary layer? (6 marks)
b) Derive the equation of the thickness of boundary layer in a laminar flow (8 marks)
c) Discuss water hammer (6 marks)

QUESTION THREE

- a) Water flows through a pipe of $200 mm \phi$ long with a velocity of 2.5m/s. Calculate the head loss due to friction. (10 marks)
b) Discuss why it is necessary to prime a centrifugal pump before pumping. (5 marks)
c) State the conclusion by fronde on the experiments that he conducted on the fluid friction in flowing water. (5 marks)

QUESTION FOUR

- a) State the relationship between power and discharge in a pipeline that is to transmit power (3 marks)
b) A jet of water of $100 mm \phi$ impinges normally on a fixed plate with a velocity of 30m/s. Calculate the force exerted on the plate. (7 marks)
c) A jet of water $50 mm \phi$ and moving with a velocity of 26m/s is impinging normally on a plate. Determine the pressure on the plate when;
i. It is fixed
ii. It is moving at a velocity of 10m/s in the direction of the jet (10 marks)

QUESTION FIVE

- a) An undershot wheel is working under a head of 2.5m with a speed of 5r.p.m. Calculate the diameter of the wheel if its efficiency is 40%. Take the coefficient of velocity as 0.98 and the ratio of peripheral velocity of the wheel to the velocity of the jet as 0.46. (8 marks)
b) Define efficiency of transmission η (2 marks)
c) A reservoir has been built 4km away from a college campus having 5000 inhabitants. Water is to be supplied from the reservoir to the campus. It is estimated that each inhabitant will consume 200 litres of water per day and that half of the daily supplies is pumped within 10 hrs. Calculate the size of the supply main, if the loss of head due to friction in the pipe is 20m. Assume coefficient of friction for the pipeline is as 0.008. (10 marks)