



TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF ENGINEERING AND TECHNOLOGY

Department of BUILDING & Civil engineering

UNIVERSITY EXAMINATION FOR:

BACHELOR OF TECHNOLOGY IN CIVIL ENGINEERING

TCV 4325 : HYDRAULICS II

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: NOVEMBER 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) A flat plate $1.5\text{m} \times 1.5\text{m}$ moves at 45 km/hr in stationary air of specific weight 11.3 N/m^3 . If the coefficients of drag and lift are 0.15 and 0.75 respectively. Calculate;
- (i) Lift force
 - (ii) Drag force
 - (iii) Resultant force
 - (iv) Power required to keep the plate in motion. **(12 marks)**
- b) Briefly explain the boundary layer theory. **(8 marks)**

QUESTION TWO

- a) A centrifugal pump is required to lift water to a total head of 40m at the rate of 50 l/s. Determine the power required for the pump, if its overall efficiency is 62%. **(7 marks)**
- b) A centrifugal pump having an overall efficiency of 62%, is required to handle brine (sp. gr. = 1.19) and gasoline (sp. gr. = 0.7). The discharge of each of these liquids is 50 l/s against a net pressure of 400 kPa. Show that the same power is required for handling both the above liquids having different specific gravity. **(13 marks)**

QUESTION THREE

- a) A Pelton wheel, working under a head of 500m produces 13,000kN at 430 r.p.m. If the efficiency of the wheel is 85%, determine;
- Discharge of the turbine.
 - Diameter of the wheel.
 - Diameter of the nozzle. (*Assume suitable data*). **(10 marks)**
- b) Water is flowing through a pipe 1,500m long with a velocity of 0.8 m/s. Calculate the diameter of the pipe, if the loss of head due to friction is 87m. (*Take f for the pipe as 0.01*). **(10 marks)**

QUESTION FOUR

- a) State Newton's Law of Resistance. **(6 marks)**
- b) Briefly explain TWO assumptions that are based on the above law. **(5 marks)**
- c) Briefly using relevant sketch, derive expression for Pascal's law. **(4 marks)**
- d) A pipe of 40mm diameter is conveying water with a velocity of 2.5 m/s. Calculate the loss of head at the entrance and exit of the pipe. **(5 marks)**

QUESTION FIVE

- a) (i) Define Pascal's Law. **(2 marks)**
- (ii) Briefly explain TWO components important in Pascal's Law formulation. **(4 marks)**

- b) A man weighing 750N descends to the ground from an aeroplane with the help of a parachute against the resistance of air. The shape of the parachute is hemispherical of 2m diameter. Determine the velocity of the parachute with which is coming down. (*Take Specific Weight of the air as 12 N/m^3*). **(9 marks)**
- c) State Assumptions made in derivation of Pascal's Principle. **(5 marks)**