



TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF ENGINEERING AND TECHNOLOGY
Department of BUILDING & Civil engineering
UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN CIVIL ENGINEERING
ECV 4509 : 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) (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)**
- d) 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. **(10 marks)**

QUESTION TWO

- 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;
- (i) Discharge of the turbine.
 - (ii) Diameter of the wheel.
 - (iii) 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 THREE

- 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 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) A flat plate 1.5m x 1.5m moves at 45 km/hr in stationary air of specific weight 11.3 N/m³. 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)**