



MACHAKOS UNIVERSITY

University Examinations for 2020/2021 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

THIRD YEAR FIRST SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (CIVIL ENGINEERING)

BCE CD 308: FLUID MECHANICS II

DATE: 16/8/2021

TIME: 2.00-4.00 PM

INSTRUCTIONS

Answer question one and any other two questions

QUESTION ONE (30 MARKS) (COMPULSORY)

- a) Define the term orifice (2 marks)
- b) Differentiate between a small orifice and a large orifice (2 marks)
- c) Outline two reasons for the difference between theoretical and actual discharge (2 marks)
- d) Name four common types of pumps (8 marks)
- e) State two types of rotary hydraulic pumps (6 marks)
- f) Differentiate between a rotary gear pump and a rotary vane pump and briefly explain how they work (10 marks)

QUESTION TWO (20 MARKS)

Make neat sketches of the following types of pumps:

- a) Gear pump
- b) Rotary vane pump

QUESTION THREE (20 MARKS)

- a) Define the term pump (3 marks)
- b) Make a neat sketch of a rotary radial piston pump and briefly explain how it works (15 marks)
- c) Briefly explain the term prime mover (2 marks)

QUESTION FOUR (20 MARKS)

An orifice has an area of 650mm^2 and a jet of water falls a distance of 0.5m in a horizontal distance of 1.5m from the vena contracta. Calculate the values of coefficients of velocity, discharge and contraction, given that the volume rate of flow is $0.117\text{m}^3/\text{s}$ and the head H above the orifice is 1.2m

QUESTION FIVE (20 MARKS)

A reservoir discharge through a rectangular sluice gate of width B and height D as shown in the figure below. The top and bottom of the opening are at depths H_1 and H_2 below the free surface. Derive a formula for the theoretical discharge through the opening. If the top of the opening is 0.4m below the water level and the opening is 0.7m wide and 1.5m in height. Calculate the theoretical discharge (in cubic metres per second) assuming that the bottom of the opening is above the downstream water level. What would be the percentage error if the opening were to be treated as a small orifice?

