



TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF ENGINEERING AND TECHNOLOGY

Department of BUILDING & Civil engineering

UNIVERSITY EXAMINATION FOR:

BACHELOR OF TECHNOLOGY IN CIVIL ENGINEERING

TCV 4425 WATER & WASTEWATER SYSTEM DESIGN

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: NOVEMBER 2024

TIME: 2 HOURS

PAPER B

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) 20 Marks

- a) With the aid of a sketch explain the breakpoint chlorination in water treatment (10 marks)
- b) A water treatment plant is required to process 28800 m³/d of raw water whose density is 1000kg/m³ and dynamic viscosity of 10⁻³ NS. The rapid mixing tank imparts rapid velocity gradient of 900m⁻¹ to blend 35mg/l of Alum with the flow for detention time of 2 minutes. Determine the power input required (6 marks)
- c) State effects of drinking untreated water (4 marks)

ANSWER ANY TWO QUESTIONS FROM THIS SECTION

QUESTION TWO (20 Marks)

- a) State the processes in treating river water (4 marks)
- b) Find the settling velocity of spherical particle size 5x10⁻³ in diameter and specific gravity 2.65. Also find the rising velocity of a particle of same diameter but specific gravity of 0.8. Assume kinematic viscosity of 1.012x10⁻² cm²/sec (6 marks)
- c) With the aid of a sketch explain the operations of slow sand filter (10 marks)

QUESTION THREE (20 Marks)

- a) State the objectives of wastewater treatment (4 marks)
- b) Design a grit chamber for a population of 50,000 with water consumption of 135l/h/d. average flow of sewage generation is 80% of water supply (10 marks)
- c) Explain the tertiary process in waste water treatment (6 marks)

QUESTION FOUR (20 Marks)

- a) Explain the conventional method of treating wastewater (10 marks)
- b) Design aerated grit chamber for treating sewage flow of 60MLD. Consider a pick factor of two. (6 marks)
- c) State the advantages of activated sludge process (4 marks)

QUESTION FIVE (20 Marks)

- a) Explain the following
 - i. Coagulation
 - ii. Flocculation (6 marks)
- b) State the reasons of filtration in water treatment (4 marks)
- c) Use a diagram to explain the working of biological(trickling filter) (10 marks)

