



# MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

P.O. Box 972-60200 – Meru-Kenya.

Tel: +254 (0)799529958, +254 (0)799529959, +254 (0)712524293

Website: [www.must.ac.ke](http://www.must.ac.ke) Email: [info@must.ac.ke](mailto:info@must.ac.ke)

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## UNIVERSITY EXAMINATIONS 2024/2025

FIRST YEAR, SECOND SEMESTER SEMESTER EXAMINATION FOR THE DEGREE OF  
MASTER OF SCIENCE IN SANITATION

### ECS 7150: SANITATION TECHNOLOGY I

DATE: JANUARY 2025

TIME: 2 HOURS

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**INSTRUCTIONS:** *Attempt any three questions*

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#### QUESTION ONE (20 MARKS)

- a) Explain the impact of climate change and urban growth on drainage systems and mitigation strategies that can be used. (8 Marks)
- b) Discuss the reason behind wide application of simplified Sewerage in Kenya and give the challenges posed by this system in the Kenyan context. (6 Marks)
- c) Explain the various green infrastructure that you would adopt to suite conditions of your identified local town. (6 Marks)

#### QUESTION TWO (20 MARKS)

- a) Explain the importance of temperature in anaerobic digestion and give methods used to obtain optimal temperatures. (2 Marks)
- b) Explain why *E. coli* and *Enterococcus faecalis* are used as indicators to measure the risk of disease transmission in faecal sludge treatment, instead of monitoring actual pathogens, given that these two are not pathogenic. (5 Marks)

- c) Describe the various components of a Decentralised waste water treatment system (5 Marks)
- d) Discuss the combination of technologies you would implement for the scenario given below. This should follow all the components of the sanitation service chain and include the resource recovery and treatment objectives and the merits of the chosen technology or technologies. (8 Marks)

A densely populated urban area requires a treatment facility. A large market is in the community, which produces a steady stream of organic waste. The market has a high demand for propane cooking fuel. About 40% of the community is serviced by public toilets. The climate is tropical.

### **QUESTION THREE (20 MARKS)**

- a) Describe the role of swales in drainage management (2 Marks)
- b) In nutrient removal, phosphorous has priority over nitrogen in controlling eutrophication. Explain. (4 Marks)
- c) With examples, explain the reasons responsible for not considering greywater reuse in household sanitation projects. (8 Marks)
- d) Discuss the objectives of urban storm water management. (6 Marks)

### **QUESTION FOUR (20 MARKS)**

- a) The condomnial System is an engineering solution based on the community participation. Discuss (4 Marks)
- b) With examples, differentiate and explain the difference between major drainage systems, minor drainage systems and sustainable drainage system. (8 Marks)
- c) Discuss the impacts of climate change on sanitation infrastructure and services. (8 Marks)

### **QUESTION FIVE (20 MARKS)**

- a) Discuss the substrate characteristics that influence the efficiency of Black Soldier fly biowaste treatment (10 Marks)
- b) Discuss the Potential advantages and constraints of Black Soldier flies (4 Marks)
- c) Discuss the Black Soldier fly end-products (6 Marks)