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(University of Choice)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY SPECIAL/SUPPLEMENTARY EXAMINATIONS 2021/2022 ACADEMIC YEAR

FOURTH YEAR FIRST SEMESTER EXAMINATIONS

FOR THE DEGREE OF BACHELOR OF SCIENCE IN CIVIL AND STRUCTURAL ENGINEERING

COURSE CODE: CSE 431

COURSE TITLE: ENVIRONMENTAL ENGINEERING

DATE: 4TH OCTOBER 2022 **TIME: 3 – 5 P.M**

INSTRUCTIONS:

1. This Paper Consists of FOUR Questions
2. Attempt Question ONE and any other TWO Questions
3. It is to the best interest of the candidate to write legible
4. Examination duration is **2 Hours**

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 2 Printed Pages. Please Turn Over.

QUESTION ONE (Compulsory) **[30 Marks]**

a) Outline any FOUR key functions of sanitation system with respect to human excreta management [6 marks]

b) Outline the main types of wastewater transport systems [6 marks]

c) Outline the importance of the following parameters in wastewater

i) Colour ii) Nutrients iv) total coliforms [6 marks]

d) Calculate the total nitrogen load in the influent to a WWTP, given a concentration of 45 mgN/L and flow = 50 L/s [4 marks]

e) The interpretation of a laboratory analysis of a river water sample taken downstream from a sewage discharge leads to the following values: (i) coefficient of deoxygenation = 0.25 d^{-1}; (ii) ultimate demand = 100 mg/L. Calculate the exerted BOD at days 1, 5 and 20. Comment on the value obtained for 20 days [8 marks]

QUESTION TWO **[20 marks]**

a) Describe indoor air quality while outlining its causes and effects [10 marks]

c) Explain why it necessary to understand microbial oxygen demand in Environmental Engineering [4 marks]

d) A water sample has a total hardness of 250 mg/L as $CaCO_3$ and a total alkalinity of 180 mg/L. What soda ash dosage (mg/L) will be required to remove the non-carbonate hardness? [6 Marks]

QUESTION THREE **[20 marks]**

a) Over a 10-day period the BOD was measured every second day and the results are tabulated below

Time (days)	2	4	6	8	10
BOD (mg/l)	14	22	27	30	32

Determine the decay rate and the ultimate BOD using the Graphical Thomas method [12 marks]

b) "All pollutants are contaminants but not all contaminants are pollutants". Discuss using relevant examples [8 marks]

QUESTION FOUR **[20 marks]**

a) Excess sodium intake can result in high blood pressure and inner ear problems for some people. The regulatory body recommends maximum allowable concentration to be 20 mg/L sodium in drinking water. Now sodium ions are used in ion exchange process. For reducing hardness from 6 to 4.5 meq/L in water, how much sodium ion is produced (mg/L) and if it poses any health risk based on given maximum concentration guideline [6 marks]

b) Water, health and sanitation is a closed loop in environmental engineering. Justify this statement [7 marks]

c) Suggest ways in which an inadequate infrastructure of a city may contribute to environmental degradation [7 marks]

----------END OF QUESTION PAPER----------