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TECHNICAL UNIVERSITY OF MOMBASA

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Faculty of Applied and Health Sciences  
Department of ENVIRONMENT & Health Sciences

**UNIVERSITY EXAMINATION FOR:  
BACHELOR OF SCIENCE IN MEDICAL ENGINEERING AND BACHELOR OF  
TECHNOLOGY IN MEDICAL ENGINEERING**

BSMD/YEAR 5 SEMESTER 1 AND BTMD YEAR 4 SEMESTER 2

TMDB 4411/EHL4502: ENVIRONMENTAL AND WASTE MANAGEMENT

Supplementary/Special Examination

Series: November 2024

Time: 2 hours

**DATE:** Pick Date NOVEMBER 2024

**Instructions to Candidates**

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** Question(s). Attempt question ONE (Compulsory) and any other TWO questions.

**Do not write on the question paper.**

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**SECTION A (Answer all the Questions)**

**(30 Marks)**

1. (a) List down major pollutants. (5 marks)
- (b) Explain the major effects of air pollution. (10 marks)
- (c) What are the objectives of liquid waste treatment? (5 marks)
- (d) List down the causes of global warming. (5 marks)
- (e) List down five sources of solid waste. (5 marks)

**SECTION B (40 Marks)**

2. Discuss the importance of Environmental Education (20 marks)
3. Discuss the effects of poor solid waste management (20 marks)
4. Discuss the liquid waste treatment process (20 marks)
5. Population explosion is one of the environmental issues facing the world today.  
Discuss the problem under the following headings
  - (a) Definition (2 marks)
  - (b) Major causes (10 marks)
  - (c) Effects (8 marks)

## **MARKING GUIDE**

**TMDB 4411/EHL4502: ENVIRONMENTAL AND WASTE MANAGEMENT**

**BSMD/YEAR 5 SEMESTER 1 AND BTMD YEAR 4 SEMESTER 2**

**SUPPLEMENTARY/SPECIAL EXAMINATION**

**SERIES: MAY 2024**

**TIME: 2 HOURS**

**DATE: Pick Date August 2024**

### **QUESTION ONE**

#### **(a) Pollutants**

- i. Air pollutants
- ii. Water pollutants
- iii. Land/ Soil pollutants
- iv. Noise pollutants

#### **(b) Effects**

- i. Air pollution is a major contributor to global warming and climate change
- ii. Exposure to air pollutants is responsible for the deterioration of human health
- iii. Contributes to the formation of acid rain
- iv. Preventing photosynthesis in plants
- v. Cause Environmental degradation

#### **(c) Objectives**

- i. Reduce the amount of biodegradable material and solids
- ii. Remove toxic materials

- iii. Eliminate pathogenic micro-organisms
  - iv. To make wastewater usable for other purposes
  - v. To improve quality of wastewater
  - vi. Preservation of water quality of natural water resources
- (d) Causes of global warming
- I. Intensive farming
  - II. Deforestation
  - III. Fossil fuels
  - IV. Waste disposal
  - V. Mining
  - VI. Overconsumption

## **QUESTION TWO**

Importance:

- i. Promoting a healthy lifestyle
- ii. Creates awareness of environmental challenges
- iii. Introduces respect for nature and why we should be kind to it
- iv. Promotes personal responsibility for the protection of the environment
- v. Supports and promotes critical and creative thinking
- vi. Strengthens communities by promoting collaborative projects
- vii. It supports sound decision-making
- viii. It supports sound decision-making
- ix. It conserves natural resources

## **QUESTION THREE**

Effects of poor solid waste management

- i. Unsightly
- ii. Breeding of disease vectors

- iii. Offensive smell /obnoxious odours
- iv. Blockage of drainage leading to flood
- v. Water pollution
- vi. land/Soil pollution
- vii. Accidents of fire
- viii. Infections
- ix. Global Warming
- x. Environmental degradation
- xi. Death of other living organisms like turtle when consuming plastics

## QUESTION FOUR

### Liquid waste treatment process

**a. Preliminary Treatment of Wastewater:** This is the first step in wastewater treatment and its objective is to remove large debris, coarse solids and heavy inorganic material contained in the wastewater flow. It consists of physical operations such as:

1. Screening: Removes heavy solids in wastewater such as rags, paper, plastics, sticks and metals to prevent damage and clogging of downstream equipment.
2. Floatation: It is used for separation of floatable and suspended solid particles from waste water.
3. Grit removal: Here, grit chambers are used to slow down the flow so that solids such as sand, ash, cinder and eggshells will settle out of the water and it can be removed manually or mechanically.

**b. Primary Treatment of Wastewater:** Large debris and grit removed in the preliminary treatment is directed to primary treatment operations and its objective is the removal of settleable organic and inorganic solids by sedimentation and the removal of materials that will float (scum) by skimming. It involves physical and /or chemical operations for treatment of wastewater.

1. It involves a more sophisticated tank called sedimentation tank or primary clarifier removes most of the suspended solids that will float or settle.
2. Sedimentation often uses chemicals like flocculants and coagulants.
3. Sludge that settles to the bottom of the clarifier is called as primary sludge and it is collected for further treatment called sludge treatment.
4. In this treatment about 50-70% of suspended solids, 35% of BOD will get reduced and it removes very few toxic chemicals.

**c. Secondary Treatment of Wastewater:** This treatment involves a biological process and its objective is the further treatment of the effluent from primary treatment to remove the residual organics and suspended solids.

1. Biological treatment process for secondary treatment are classified as aerobic (in the presence of oxygen) and anaerobic (in the absence of oxygen).
2. In most of the cases, secondary treatment involves biological treatment processes called Activated sludge Process. Aerated Lagoon, Trickling filters, Oxidation Pond, Rotating biological contactors.
3. During this process, primary effluent enters aeration tank where air is mixed with sludge and hence many microorganisms remove biodegradable organic matter.
4. A secondary sedimentation tank allows the microorganisms and solid wastes to form clumps and settle.
5. After this treatment, It generally removes 80-90% of all the pollutants have been removed and large proportion of toxic chemicals are removed.

**d. Tertiary/Advanced Treatment of Wastewater:** It is the final treatment stage of wastewater processing and its main objective is the removal of specific wastewater constituents which cannot be removed in previous stages and thereby increase the quality of the effluent to higher degree.

1. It utilizes some form of filtration to remove higher level of suspended solids which was not possible through primary and secondary screening and sedimentation.
2. Nutrients, heavy metals, specific toxic chemicals and other pollutants/contaminants are removed during this process.

3. It can remove more than 99% of all the impurities from sewage, producing an effluent of almost drinking-water quality.
4. It involves Disinfection which can be attained by means of physical disinfectants like UV light and chemical disinfectants like Chlorine.
5. During this process significant percentage of pathogenic organisms are killed or controlled.

## **QUESTION FIVE**

(a) Definition: A sudden increase in the number of individuals in a particular species.

(b) Causes

- i. Increase in Birth Rate
- ii. Decrease in Death Rate/ Falling mortality rate
- iii. Early Marriage
- iv. Religious and Social Reasons
- v. Poverty
- vi. Standard of Living
- vii. Illiteracy
- viii. Underutilized contraception/ Lack of contraception
- ix. Lack of female education

(c) Effects

- i. Environmental Degradation
- ii. More Pressure on Land
- iii. Problem of Unemployment
- iv. Increased conflicts
- v. Higher risk of disasters and pandemics