



# MANICALAND STATE UNIVERSITY OF APPLIED SCIENCES

**FACULTY OF ENGINEERING, SCIENCE AND TECHNOLOGY**

**DEPARTMENT: CHEMICAL AND PROCESSING ENGINEERING**

**MODULE: ENVIRONMENTAL MANAGEMENT AND RISK ASSESSMENT**

**CODE: HCHE 526/HMIE 525**

**SESSIONAL EXAMINATIONS**

**APRIL 2023**

**DURATION: 3 HOURS**

**EXAMINER: K NYENYAYI (MR)**

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## INSTRUCTIONS

1. Answer *All* in Section A
2. Answer *three* questions in Section B.
3. Start a new question on a fresh page
4. Total marks 100

*Additional material(s): Graph Book, Calculator.*

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## SECTION A

### QUESTION 1

- a) What do you understand by the following terms:
- i. *Sustainability*
  - ii. *HAZOP analysis*
  - iii. *water demand management (WDM)*. [6]
- b) Briefly explain any **two** policy instruments that can be used to control negative pollution externalities by mining or chemical processing companies. [6]
- c) Define the concept of *decoupling* and briefly discuss decoupling as policy imperative and pathway to circular economy. [8]

### QUESTION 2

- a) Identify the **three** main sources of water and give 2 advantages associated with each source. [9]
- b) Give any 3 water source selection considerations. [3]
- c) Discuss factors which affect water consumption within a mining or chemical process facility. [8]

## SECTION B

### QUESTION 3

- a) It is recommended that organization develops a Risk and Legal Register at Company level and/or departmental level to capture all the legal requirements that impinges on its operations. Draw up a Risk and Legal Register for an organization operating in any one of the following sectors:
- Dairy processing
  - Mining and Quarrying

- Fertilizer Production [12]

b) Risk assessment should be seen as a continual process. As an engineering intern at a chemical processing or mining facility, when and how would you propose to review Hazard Identification and Risk Assessment (HIRA) at the facility? [8]

#### QUESTION 4

a) Discuss the approaches you would use in water demand forecasting for mining or chemical processing facility. [10]

b) ABC Mining Group in Buhera Zimbabwe has 15 years of recorded and reliable water use figures and the available historical water use data is shown in **Table 1**.

**Table 1**

Year	$\times 10^6 \text{ m}^3$
2005	8.5
2007	10.3
2009	14.1
2011	15.9
2013	18.1
2015	19.8
2017	23.22

i. By means of a graph, develop a linear regression fit for purpose of forecasting water use until year 2030. [7]

ii. Use your graph to estimate water use between 2023 and 2025. [3]

### **QUESTION 5**

Justify business case for Integrated Management Systems (IMS) at organizational, regional and global context. [20]

### **QUESTION 6**

Discuss the status of environmental management regulations in Zimbabwe with particular reference to their effectiveness, strengths, weaknesses and comparability either regionally or internationally. [20]

**END OF EXAMINATION**