



# MANICALAND STATE UNIVERSITY OF APPLIED SCIENCES

## FACULTY OF ENGINEERING

DEPARTMENT: CHEMICAL AND PROCESSING ENGINEERING

MODULE: ENVIRONMENT MANAGEMENT AND RISK ASSESSMENT

CODE: HCHE526/HMIE 525

SESSIONAL EXAMINATIONS

JULY 2021

DURATION: 3 HOURS

EXAMINER: MR K. NYENYAYI

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### INSTRUCTIONS

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

*Additional material(s): Calculator, Graph paper*

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## SECTION A

### QUESTION ONE

- a) What do you understand by the following terms; *sustainability*, *HAZOP analysis* and *water demand management (WDM)*. [6]
- b) Briefly explain any three (3) policy instruments that can be used to control negative pollution externalities by mining or chemical processing companies. [9]
- c) With reference to mining or industrial manufacturing projects, outline how Environmental Impact Assessments (EIAs) assists in protecting the of environment and achieving sustainable development. [5]

### QUESTION TWO

- a) With reference to the hydrological cycle processes, deduce the water balance equation. [6]
- b) Discuss factors which affect water consumption within a mining or chemical process facility [6]
- c) Briefly explain the 4 stages of Risk Management within a work system. [8]

## SECTION B

### QUESTION THREE

a) It is recommended that organization develops a 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]

d) Outline any three opportunities and/or challenges leading to the need of Intergrated Solid Waste Management (ISWM) in global context .

[3]

e) Give any five benefits of Integrated Management Systems (IMS) to a chemical or mining organisation.

[5]

### QUESTION FOUR

a) Give any 4 motivations to carrying out Hazard Identification and Risk Assessment (HIRA) in chemical or mining industrial workplaces.

[4]

b) A contractor working at a mineral processing facility has been injured after a boiler explosion at the facility. Use a Fault Tree Analysis to assess Cause-Effect Relationships of the incident.

[10]

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

[6]

### QUESTION FIVE

a) Identify the three main sources of water and give 2 advantages of associated with each source.

[6]

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.

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 a, develop a linear regression fit for purpose of forecasting water use until year 2030.

[9]

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

[5]

## **QUESTION SIX**

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

[20]

**THE END**