FACULTY OF ENGINEERING AND ENVIRONMENT

DEPARTMENT OF METALLURGICAL ENGINEERING

FUELS, ENERGY AND THE ENVIRONMENT

EMR 2205

Final Examination Paper

June 2024

This examination paper consists of 3 printed pages

Time Allowed: 3 hours

Total Marks: 100

Examiner's Name: Eng C Mazemo

INSTRUCTIONS

1. Answer any 5 **QUESTIONS**
2. Use of calculators is permissible

Additional Requirements: NONE

MARK ALLOCATION

Each question carries	**20 Marks EACH**
Total Attainable	**100**

ANSWER 5 QUESTIONS

QUESTION 1

a) Explain how 3 Ts of combustion relate to the efficiency and safety of the combustion processes [8]
b) List and explain four characteristics of a good fuel?[5]
c) Explain the difference between gross calorific value and net calorific value [7]

QUESTION 2

a) During a boiler trial the coal analysis on mass basis was reported as C = 62.4%, H2 = 4.2%, O2 = 4.5%, Moisture = 15% and Ash 13.9%. Calculate minimum air required to burn 1 Kg. of coal, [6]
b) calculate H.C.V. and L.C.V. [6]
c) Give the significance of ultimate analysis of fuel. How is % of carbon & hydrogen determined in this analysis. [8]

QUESTION 3

a) Explain the natural processes involved in the reduction and breakdown of cyanide compounds in the environment **[8]**
b) Describe the impact of oil and gas production on the environment. **[4]**
c) State and explain the **three** stages of the air pollution cycle. **[8]**

QUESTION 4

a) Explain the importance of EIA when a project is to be established in an area. **[10]**
b) State and explain the **five** steps involved in a typical metallurgical plant waste management **[10]**

QUESTION 5

Discuss The Role of Renewable Energy in Reducing Greenhouse Gas Emissions [20]

QUESTION 6

Solid waste materials obtained from smelting ferrochrome are metal, slag, and dust. Explain the toxicity of chromium wastes and the methods used to treat or remove the chromium from soils, water and air. **[20]**

END OF QUESTION PAPER