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#### MANICALAND STATE UNIVERSITY OF APPLIED SCIENCES

**FACULTY OF ENGINEERING, APPLIED SCIENCES AND TECHNOLOGY**

**DEPARTMENT: METALLURGICAL ENGINEERING**

**MODULE: METALLURGY OF IRON AND STEEL**

**CODE: ENGM 316**

**SESSIONAL EXAMINATIONS**

**JUNE 2023**

**DURATION: 3 HOURS**

**EXAMINER: MS MT MAJAHA**

## **INSTRUCTIONS**

1. *Answer any* ***four questions***
2. *Total marks 100*

***ADDITIONAL MATERIALS***

*None*

**QUESTION 1**

1. Differentiate between wrought iron and cast iron [4]
2. What is the effect of alloying iron with carbon? [2]
3. Describe briefly the early manufacturing methods of iron [7]
4. Describe the forms of pollution associated with steel plants and the control measures [12]

**QUESTION 2**

1. Describe and explain the methods used to prepare iron ore before its use in the blast furnace [15]
2. Describe briefly the reactions which occur in the blast furnace [7]
3. Outline the functions of coke in the blast furnace [3]

**QUESTION 3**

1. Define and classify refractories [12]
2. Give uses of any four refractories [8]
3. What are the characteristics that a good refractory should possess? [5]

**QUESTION 4**

1. Most of the iron emerging from the furnace is converted into steel, which involves the removal of elements like Sulphur, carbon, phosphorus and silicon. The basic oxygen process does this in two stages.
2. Describe briefly how Sulphur is removed from the first stage [5]
3. Describe briefly how the other elements are removed in the second stage, making clear what happens to the carbon, phosphorus and silicon present in the impure iron. [8]
4. State and explain features of the basic oxygen furnace [12]

**QUESTION 5**

* 1. Explain the following steel casting methods
     1. Ingot casting
     2. Continuous casting [8]

1. What are some of the defects found in cast ingots? [5]
2. State and explain the four main types of stainless steel [12]

**END OF EXAMINATION**