

**PROGRAM**

BACHELOR OF TECHNOLOGY  
*EXTRACTION METALLURGY*

**SUBJECT**

**INDUSTRIAL MINERALS 4**

**CODE**

**MIL41-1**

**DATE**

SUPPLEMENTARY EXAMINATION  
DECEMBER 2019

**DURATION**

(SESSION 1) 08:30 - 11:30

**WEIGHT**

40 : 60

**TOTAL MARKS**

100

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**ASSESSOR**

Dr BM KANYANE

**MODERATOR**

Ms MAPILANE MADIBA

**NUMBER OF PAGES**

3 PAGES

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**INSTRUCTIONS**

- First read carefully through all questions; only then
- Answer all questions in any sequence – but
- Please start answering each question on a new page
- Calculators are permitted

## **QUESTION 1** **[26]**

### *Ferroalloys*

- 1.1 Which three properties of steel are improved by vanadium? (3)
- 1.2 Which three reductants can be used for ferrovanadium production? (3)
- 1.3 What are three grades of ferrochrome? specify composition range (FeCr, C, Si) (9)
- 1.4 What are four reactants for Silicomanganese production? (4)
- 1.5 Which three properties of steel are affected by chromium? (3)
- 1.6 Which two routes are used to produce refined ferromanganese? (4)

## **QUESTION 2** **[10]**

### *Chromite*

- 2.1 List stages (in sequence) of FeCr production from chromite fines (specify binder, operating temperature and reductant mixing stage) (10)

## **QUESTION 3** **[14]**

### *Asbestos*

- 3.1 List two diseases caused by asbestos (4)
- 3.2 What is a typical formula of asbestos? (2)
- 3.3 List five uses of asbestos (5)
- 3.4 List three minerals that have replaced asbestos in some applications (3)

## **QUESTION 4** **[10]**

### *Ferrosilicon/silica*

- 4.1 What are three effects of silicon in steel? (6)
- 4.2 What are four grades of ferrosilicon? (4)

## **QUESTION 5** **[20]**

### *Heavy mineral sands*

Describe the *chloride ilmenite process*, use equations where necessary

## **QUESTION 6** **[10]**

### *Diamonds*

- 6.1 Describe how the X-ray sorter works (6)
- 6.2 What is a grease belt used for? (4)

**QUESTION 7****[10]***Fluorspar*

7.1 What are the uses of acid spar? (5)

7.2 How is HF formed? (5)

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TOTAL = 100

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