



UNIVERSITY OF
KWAZULU-NATAL
INYUVESI
YAKWAZULU-NATALI

SCHOOL OF ENGINEERING

EXAMINATIONS: NOVEMBER 2018

COURSE AND CODE: PETROLUEM & SYNTHETIC FUEL PROCESSING

ENCH4PP

DURATION: 2 HOURS

TOTAL MARKS: 100

INTERNAL EXAMINERS: PROF AH MOHAMMADI

INTERNAL MODERATOR: PROF A STARK

EXTERNAL MODERATOR: DR M CHETTY

INSTRUCTIONS:

1. **ALL** questions should be attempted.
2. Any programmable or non-programmable calculator may be used provided it has been cleared of any information that would subvert the purpose of the examination.
3. Calculations must be shown in sufficient detail to illustrate your understanding of the procedure.

QUESTION 1

Consider the following two processes: An H_2SO_4 based Alkylation Process and an HF based Alkylation Process.

Discuss the advantages and disadvantages of the aforementioned processes.

TOTAL /15/

QUESTION 2

For the following three units in a crude oil refinery, (a) Hydrotreating, (b) Merox and (c) Amine units, discuss the following:

- i. their functions
- ii. the feed and product streams entering and leaving the units,
- iii. typical solvent/catalyst used

TOTAL /15/

QUESTION 3

- a) Compare the products of a hydrocracker to the products of a Fluidized Bed Catalytic Cracking (FCC) unit. Discuss the differences in the quality and components present in the product stream.
(4)
- b) Zeolite catalyst is used in a FCC unit. However, this presents a problem in the process. Explain what happens to the catalyst in the FCC unit and how the problem can be remedied.
(4)
- c) Explain and discuss the reasons for the treatment stage of the feed before the FCC unit.
(4)
- d) Explain why a hydrotreater is not utilized in a hydrocracking unit.
(4)
- e) Sketch a diagram of a FCC unit and indicate the feed and the product streams.
(4)

TOTAL /20/

QUESTION 4

For the production of lube oil, provide a block flow diagram describing the (i) Extraction and (ii) Conversion processes.

TOTAL /10/**QUESTION 5**

- a) Among the various gasolines produced in a typical crude oil refinery, list 6 gasolines of a lower quality and list 2 gasolines of a higher quality grade product.

(8)

- b) List two important gasoline properties that should be considered in product blending and explain why they are important.

(2)

TOTAL /10/**QUESTION 6**

- a) Explain what is synthetic fuel.

(5)

- b) Explain the different methods for the production of synthetic fuel. Which method(s) is(are) the most frequently used(s) for producing synthetic fuel? Mention the names of the processes as well.

(10)

TOTAL /15/**QUESTION 7**

In a coal gasification process,

- i. What is the main product?

(2)

- ii. List six by- products in the above process.

(6)

- iii. Explain the main limitation of using a coal gasification process.

(7)

TOTAL /15/