Reg No.:_____ Name:_____

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

Seventh Semester B.Tech Degree Examination (Regular and Supplementary), December 2020

**Course Code: CH461**

**Course Name: PETROLEUM REFINERY ENGINEERING**

Max. Marks: 100 Duration: 3 Hours

**PART A**

***Answer any two full questions, each carries 15 marks.*** Marks

1 a) Describe the origin and formation of petroleum. (7)

b) With neat sketch, explain vacuum distillation process. List various products obtained from vacuum distillation of crude. (8)

2 a) Explain the composition of petroleum and general properties of homologous series. (6)

b) With a neat sketch, explain the working of any one type of pipe still heater. (5)

c) The volume average boiling point of Saudi heavy crude oil is 641.91°F. If the API gravity is 30.38, determine the Watson Characterization factor for Saudi heavy crude oil. (4)

3 a) Explain the following: (8)

(i) Sweet and sour crude

(ii) Flash point and fire point

(iii) ASTM and True boiling point distillation

(iv) UOP Characterization factor and Correlation index

b) Explain the need of dehydration and desalting of crude oil. With a neat labelled diagram, describe single stage electric desalting process. (7)

**PART B**

***Answer any two full questions, each carries 15 marks.***

4 a) Explain Visbreaking process. Compare and contrast soaker Visbreaking and coil Visbreaking techniques. (7)

b) With the help of a neat sketch, describe the important sections of a fluidized catalytic cracker unit. Explain what happens to conversion in a FCC unit when only the (i) feed temperature is increased, (ii) air to the regenerator is increased and (iii) the reactor outlet temperature is decreased. (8)

5 a) Explain the effect of various parameters like temperature, residence time and C/H ratio on yields of important products from various feed stocks during Thermal cracking operation. (6)

b) Write the role of alkylation in a petroleum refinery. Explain the mechanism of alkylation process. With a neat sketch, describe $H_2SO_4$ alkylation process. (9)

6 a) With neat flow diagram, describe the Delayed Coking process. Give the operating conditions and product yield. (8)

b) Define reforming process. Explain catalytic reforming process and list all the reactions involved in the catalytic reforming of naphtha. (7)

## PART C

***Answer any two full questions, each carries 20 marks.***

7 a) A process uses liquid sulphur dioxide as the solvent in the manufacture of premium kerosine. Name the process. With a neat sketch, explain the process. (8)

b) Describe sulphuric acid treatment process for sulphur removal with the reactions involved. (5)

c) List and explain the desirable properties and test methods of kerosene to be used as a domestic fuel. (7)

8 a) Describe any two sweetening processes used in petroleum refinery with relevant figures. (9)

b) Describe the properties, test methods and uses of jet fuel. (7)

c) List and explain any four test methods that are used to evaluate the combustion properties of petroleum products. (4)

9 a) Explain the need of dewaxing process in a petroleum refinery. With a simplified flow diagram, describe ketone dewaxing processes employed in petroleum refinery. (10)

b) Explain the process of selection of crude for bitumen manufacture. Describe the different methods to test the quality of bitumen. (7)

c) List and explain any three test methods that are used to evaluate the tendency of a hydrocarbon to produce potentially explosive vapours. (3)

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