

Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/B.Tech (CHE)/SEM-7/CHE-704B/2011-12**

**2011**

**PETROLEUM REFINERY ENGINEERING**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

**GROUP – A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any *ten* of the following : 10 × 1 = 10

- i) Average boiling point used for determining the characterization factor is
  - a) volume average boiling point
  - b) molal average boiling point
  - c) cubic average boiling point
  - d) none of these.
  
- ii) Good quality kerosene should have
  - a) low smoke point
  - b) high smoke point
  - c) high aromatics content
  - d) low paraffin content.



- iii) The diesel index is defined by
- $(^\circ\text{API}) \times (\text{Aniline point}, ^\circ\text{F}) / 100$
  - $(^\circ\text{API}) \times (\text{Aniline point}, ^\circ\text{C}) / 100$
  - $(^\circ\text{API}) \times 100 / (\text{Aniline point}, ^\circ\text{F})$
  - $(^\circ\text{API}) \times 100 / (\text{Aniline point}, ^\circ\text{C})$ .
- iv) LPG is a mixture of
- Pentane & Ethane
  - Propane & Butane
  - Ethane & Methane
  - Hexane & Butane.
- v) Viscosity index is an important parameter for which fraction of the petroleum crude ?
- Gasoline
  - Kerosene
  - Diesel
  - Lube Oil.
- vi) Which is the most ideal feedstock for 'coking' process for the manufacture of petroleum coke ?
- Naphtha
  - Diesel
  - Light gas oil
  - Vacuum residue.
- vii) If 10% boiling point in the ASTM distillation is low, then
- vapour loss is negligible
  - vapour loss is high
  - flash point is high
  - all of these.





**GROUP – B**

**( Short Answer Type Questions )**

Answer any *three* of the following.

3 × 5 = 15

2. 40% of a LSR gasoline ( 35° API ), 30% of polymer gasoline ( 40° API ) and 30% of alkylated gasoline ( 30° API ) are blended. What is the °API of the blend ? Calculate also the characterization factor of this blend has 140, 170, 210, 245, 280, 310, 350 & 370 °F as 10, 20, 30, 40, 50, 60, 70 & 80% Boiling point.

Given : *sp. gr.* of the blend : 0.785

2 + 3

3. What is the importance of ASTM distillation ? Discuss the experimental procedure. 2 + 3
4. a) Why 'reboilers' are not used in crude distillation unit ?  
b) Briefly describe different reflux arrangement used in the atmospheric distillation unit of a petroleum refinery. 1 + 4
5. What do you mean by 'TBP overlap' and 'ASTM gap'. Explain your answer graphically. 2 + 3
6. What is 'Visbreaking' operation ? Briefly explain the effects of different operating variables on the yield of products.



**GROUP – C**

**( Long Answer Type Questions )**

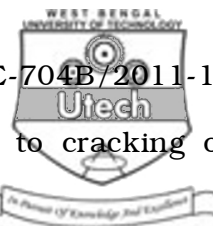
Answer any *three* of the following.  $3 \times 15 = 45$

7. a) What type of impurities are present in crude oil ?
- b) Explain the method of desalting of crude oil with a neat sketch of single electrical desalting process.
- c) Explain the hydrocarbon present in crude and the percentage of elemental composition.
- d) A lube oil consists of 4 fractions A, B, C and D. Their molar compositions and vapour pressure are given below :

Constituents	Mole %	Pure component vapour pressure in mm Hg
A	10	700
B	20	720
C	30	740
D	40	750
	Total = 100	



8. a) What is polymer gasoline ?
- b) What are the feedstock and common catalyst used for production of polymer gasoline ?
- c) Using a process flow diagram, describe the production of polymer gasoline mentioning all the operating conditions employed. 2 + 4 + 9
9. a) Why is hydro treatment necessary in petroleum refinery ? 2
- b) What are different impurities present ? Show the chemical reactions involved in the hydrotreatment of a petroleum feedstock consisting of S, N, O and Cl bearing impurities. 4
- c) Using a process flow diagram, describe the hydrotreatment operation, mentioning influence of different operating parameters and catalyst employed. 9
10. a) "Catalytic Cracking is preferred to Thermal Cracking", explain.
- b) What is feedstock for catalytic cracking process ?



c) What are the properties changed due to cracking of higher molecular weight hydrocarbon ?

d) With a neat sketch describe the process of fluid catalytic cracking of process. 4 + 1 + 2 + 8

11. Write short notes on any *three* of the following : 3 × 5

a) Biodiesel

b) Alkylatioin operation for production of *i*-octane

c) Merox sweetening process

d) Reactions pertaining to catalytic reforming operation of HSR naptha.

=====