B.Tech. Sixth Semester (Food, P & P, O & P and Petro. Tech.) (CGS)

11048 : Petrochemical Technology - III : Paper - 6 PC 04

P. Pages : 2 **AU - 2819**

Time : Three Hours * 0840 * Max. Marks : 80

Notes :
1. Due credit will be given to neatness and adequate dimensions.
2. Assume suitable data wherever necessary.
3. Diagrams and Chemical equations should be given wherever necessary.
4. Illustrate your answer necessary with the help of neat sketches.
5. Discuss the reaction, mechanism wherever necessary.
6. Use of Refinery engg. charts permitted.
7. Use of pen Blue/Black ink/refill only for writing the answer book.

SECTION - A

1. Vaporization of natural gasoline is conducted at 1750 kN/m^2 pressure and 40°C temperature. Calculate the composition of residue gasoline and vaporized gasoline? The natural gasoline has the following composition. **13**

Hydrocarbon	C_1	C_2	C_3	i C_4	n C_4	C_5	C_6
% composition	10	10	25	10	15	15	15
Vapour pressure kN/m^2	28270	5172	1340	539	388	133	29

OR

2. Calculate the dew point temperature for the following hydrocarbon feedstock at 180 psia pressure. **13**

Hydrocarbon	C_2	C_3	n C_4	i C_4	n C_5
% composition	15	15	30	25	15

3. a) Mention the most common distillation ranges of crude oil fractions used in international assays of crude oils. **4**

b) Experimental TBP data for a crude oil is obtained as follows- **9**

% Distillate:	10	30	50	70	90
Temperature, °C	126	224	325	430	540

Compute the EFV curve from this data by Edmister method, and determine the temperature required to Vaporize 80% material by flash Vaporization.

OR

4. a) Mention the factors that may affect the efficiency of TBP apparatus. **3**

b) Experimental TBP data for a petroleum fraction is given below, compute the EFV curve from this data by Nelson's method. **10**

% Distillate	IBP	10	30	50	70	90	FBP
Temperature, °C	238.9	291.7	325	350	373.9	411.7	460

5. A crude oil is heated in a Pipestill heater and amount of material Vaporized at the outlet of heater is 65%. Suppose the crude oil is heated to 246°C temperature by exchanging heat with products and the material corresponding to this temperature is removed before sending the crude oil to the pipestill heater. Calculate the temperature of crude oil at the heater outlet for 65% Vaporization. What temperature would have been required if the material corresponding to 246°C temperature is not removed? The TBP data for the crude oil is as follows **14**

% Distillate	IBP	10	30	50	70	90	FBP
Temperature, °C	90	156	246	315	380	480	590

OR

6. The ASTM distillation data for a stabilized gasoline fraction of 60 °API gravity is given below - **14**

% Distillate	IBP	10	30	50	70	90	FBP
Temperature, °C	17	47	86	115	142	172	204

Calculate the temperature required to Vaporize 80% material by flash Vaporization at 20 kg/cm^2 pressure.

SECTION - B

7. a) How the design of fractionation system can be outlined? **4**

b) While designing the refinery and refinery operations, in what way design computations can be organized? Explain in detail. **10**

OR

8. a) Why stabilization of crude oil is done? **4**

b) What do you mean by "ASTM gap" and "TBP overlap"? Discuss their utility in crude oil distillation column design. **10**

9. a) What schedule of heat distribution may be employed for satisfactory design of tube still heater? **3**

b) A petroleum stock of specific gravity 0.8525 is passed through a chain of heat exchangers at the rate of 1220 bbl/hr and is allowed to enter directly in the radiant section of the box type at 220°C. The heater is designed to burn 3510 kg/Hr of refinery gases as a fuel. The net heating value of fuel is 48×10^6 kJ/kg. The radiant section contains 150 sq. meter of projected area of one row of tubes, having 10.5 cm O. D. and 12 meter long, and spaced at a distance of two times O. D. Find the outlet temperature of feedstock. **10**

Data Given :

i) Air fuel ratio = 25

ii) $\alpha = 0.88$

iii) Avg. sp. heat of stock = 2.26 kJ/kg, °C.

OR

10. a) What do you understand by overburdened tubes (hot tubes) of tube still heater? **3**

b) A pipestill heater uses 7510 lb/Hr of cracked refinery off gas, having net heating value 20570 Btu/lb. The radiant section contains 1500 sq. ft. of projected area. The tubes having 5 inch O. D. are spaced at centre-to-centre distance of 10 inch. There is one row of radiant tubes and they are 40 ft. long. The air-fuel ratio is 25. What percentage of the heat liberation is absorbed in the radiant section and how many Btu are absorbed per hour through each sq. ft. of projected area? **10**

11. a) What is the excess air requirement of fuels when fired in pipe stills and boilers? **4**

b) Robert Reed analyzed oil-fired burner troubles. Name these troubles and discuss the causes of these troubles in detail. **9**

OR

12. a) What do you understand by -------
i) Heating value, ii) Net heating value,
iii) Gross heating value. **3**

b) One thousand cubic feet of flue gas is cooled from 1000 °F to 100 °F. Analysis of gas is --- **10**

i) CO_2 -10% ii) H_2O vapour - 12%

iii) O_2 -------- 3.7% & iv) N_2 -------- 74.3%

How much heat must be removed to cool down the gases to 100 °F from 1000 °F temperature? (Note :- 1 lb mole of gas occupies 379 cubic feet at 60 °F and 14.7 psia pressure).

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