B.Sc. (Part–II) Semester–III Examination

3S : PETROCHEMICAL SCIENCE

Time : Three Hours] [Maximum Marks : 80

Note :— (1) Question No. **1** is compulsory and carries 8 marks.
(2) Remaining **SIX** questions carry **12** marks each.
(3) Draw the diagrams and mention chemical equations wherever necessary.

1. (A) Fill in the blanks with appropriate words :— ½×4=2

(i) _____ fraction of steam cracking effluent is also known as B-B fraction.

(ii) Catalytic cracking is distinguished from Thermal cracking in the reaction mechanism, which is called _____ mechanism.

(iii) Much desired reformate is influenced by the characteristics of _____ and catalyst.

(iv) The reduction of the viscosity of atmospheric distillation residues by mild thermal cracking operation is known as _____.

(B) Choose correct alternative :— ½×4=2

(i) Ethyl benzene is generally manufactured by :

(a) hydrogenation process (b) oxidation process
(c) alkylation process (d) isomerization process

(ii) The desirable reaction in catalytic reforming is :

(a) cracking (b) hydrogenation
(c) alkylation (d) dehydrogenation

(iii) The main reaction in steam cracking is :

(a) Isomerization (b) Cyclization
(c) Dehydrogenation (d) Polymerization

(iv) LHSV stands for :

(a) liquid hourly space velocity
(b) liquid hours settling velocity
(c) light and heavy settling vapours
(d) light hydrocarbon settling vapours

(C) Answer the following questions in **ONE** sentence each :— 1×4=4

(i) Why heavy straight run naphtha fraction is preferred as feed stock for catalytic reforming process ?

(ii) What do you mean by CDE ?

(iii) What do you understand by "free radical" ?

(iv) How the activity of reforming catalysts can be restored ?

2. (A) The properties of thermally cracked products are very much different from the feedstock used. Name the properties that are expected to undergo change. 3

(B) Why heavy fractions crack easily during thermal cracking ? Explain with main process parameters involved. 4

(C) Discuss the effect of pressure on thermal cracking operation. 5

OR

3. (P) What do you mean by thermal cracking or pyrolysis ? 2
   (Q) Why cracking operations became necessity of petroleum refinery ? 4
   (R) Discuss the free radical mechanism in detail with suitable reactions involved. 6

4. (A) Name the impurities that are usually present in ethylene obtained from steam naphtha crack ng. 2
   (B) Explain the importance of ethylene as a basic petrochemical with suitable examples of large number of chemicals derived from it. 10

OR

5. Discuss the steam naphtha cracking process in detail with neat sketch of flow diagram and process parameters involved. 12

6. (A) What are the advantages of zeolite catalysts over the natural and synthetic amorphous cracking catalysts ? 4
   (B) The products formed in the catalytic cracking are the result of both primary and secondary reactions. How these primary reactions can be represented ? 4
   (C) Discuss the feedstock selection for catalytic cracking in brief. 4

OR

7. (P) What is the significance of catalytic cracking ? 4
   (Q) What do you mean by carbonium ion ? Discuss the carbonium ion mechanism in detail with the reactions involved 8

8. Draw the neat sketch of FCC unit designed by Texaco Development Corporation and discuss the significance of Riser, Reactor and Regenerator in detail. 12

OR

9. Discuss the recovery of propylene from the catalytic cracking effluent stream in detail with the neat sketch of flow diagram 12

10. (A) Name the various processes for the manufacturing of butadiene. 2
    (B) Butadiene may be prepared from ethanol by one step process or by two step process. Discuss the chemistry involved in these two processes. 5
    (C) Discuss the market for butadiene with percentage share. 5

OR

11. (P) Describe the manufacture of butadiene by catalytic dehydrogenation of butenes with the chemistry and the process parameters involved. 6
    (Q) Butadiene is purified either by extractive distillation or by selective extraction from the C_4-fraction of steam-naphtha cracker. What is the typical composition of this fraction ? 6

12. (A) What are the principal sources of BTX aromatics ? 2
    (B) Discuss the recovery of BTX from reformate gasoline by Undex process with neat sketch of flow diagram. 10

OR

13. (P) Which reactions are directly related with the partial pressure of hydrogen in catalytic reforming process ? Discuss the overall effect of pressure on this process. 6
    (Q) Mention the chemistry involved in the catalytic reforming process. 6