B.Sc. Part—II Semester—III Examination

PETROCHEMICAL SCIENCE

Time : Three Hours] [Maximum Marks : 80

Note :—(1) Question No. **1** is compulsory.
(2) Give chemical reactions wherever necessary.
(3) Illustrate the answer with the neat flow diagrams wherever necessary.
(4) Use pen of Blue/Black Ink/refill for writing the answers.

1. (A) Fill in the blanks : 2

(i) _____ free radical have higher life.
(ii) _____ operation means reduction in viscosity.
(iii) Crystalline alumina-silicates is also known as _____.
(iv) Reactor temperature and _____ are truly independent variables in catalytic cracking.

(B) Choose correct alternative :— 2

(i) _____ compound exhibits pugnacious effect on catalyst.
(A) Sulfur and nitrogen (B) Sulfur and hydrogen
(C) Sulfur and oxgyen (D) Sulfur and carbon

(ii) Furfural cannot separate _____ from butadiene.
(A) 2 butane (B) butane
(C) butene (D) 2-butene

(iii) Upgradation of low octane gasoline catalytically is known as :
(A) Catalytic reforming (B) Thermal cracking
(C) Thermal reforming (D) Catalytic reforming

(iv) With increase in yield per pass the heat of decomposition _____ in thermal cracking.
(A) Increases (B) Decreases
(C) Remains same (D) None of these

(C) Answer in one sentence :— 4

(i) What is ions ?
(ii) Which are the main process parameters that govern the thermal cracking operation ?
(iii) Which type of compounds lead to formation of carbonium ion mechanism.
(iv) Which process is used for purification of butadiene from C4 cuts ?

2. (A) Why thermal cracking is required ? Describe thermal cracking mechanism in detail. 8

(B) Discuss the effect of operating variable on cracking operation. 4

OR

3. (P) After cracking operation, properties of cracked material changes; name these properties and discuss in brief. 6

(Q) Describe chemistry of thermal cracking operation. 6

4. (A) Which are the advantages of Visbreaking ? 4

(B) Describe engineering considerations for steam cracking of naphtha. 4

(C) Focus on the future of ethylene with respect to the market available. 4

OR

5. (P) In coking operation decoking is important part. Why ? Explain in detail. 6
   (Q) Draw and explain ethylene product tree in detail. 6
6. (A) Which commercial catalysts are used in catalytic cracking operation ? 6
   (B) Describe catalytic cracking reactions in detail. 6

OR

7. (P) Compare amorphous catalysts and zeolite catalysts used in cracking operation. 6
   (Q) Feed stock or raw material is important part in cracking operation. Which type of feed stocks are used in catalytic operation ? 6
8. (A) Describe catalytic cracking of petroleum distillate fraction for production of propylene with respect to the process flow and reactions involved. 8
   (B) Describe operating variables used in catalytic cracking operation. 4

OR

9. (P) Describe Houdry flow catalytic cracking process in detail with the neat flow diagram and process parameters involved. 8
   (Q) Which type of catalytic crackers are used in catalytic cracking operation ? Describe with their types and working. 4
10. (A) Discuss the market for butadiene in detail with the percent share in the manufacture of various products 6
   (B) In the Houdry process n-butane is dehydrogenated to butadiene in one step. Explain this process in brief with the process parameters and chemistry involved. 6

OR

11. (P) What do you mean by "B-B" fraction ? Mention the content of this fraction in brief with the factors responsible for yield of main product. 6
   (Q) Discuss the chemistry involved in catalytic dehydrogenation of butenes to butadiene with the process parameters involved. 6
12. (A) Discuss the effect of temperature on the reforming process in detail. 6
   (B) Explain the recovery of benzene from BTX-fraction. 6

OR

13. (P) Mention the various processes available for the manufacture of BTX. 4
   (Q) Discuss the undesirable reactions that may occur during catalytic reforming process. 4
   (R) What is the typical feed and product composition for the catalytic reforming process in terms of PONA analysis ? 4