RAMAKRISHNA MISSION VIDYAMANDIRA
(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FIFTH SEMESTER EXAMINATION, DECEMBER 2015
THIRD YEAR [BATCH 2013-16]
Date : 15/12/2015   **INDUSTRIAL CHEMISTRY [Hons]**
Time : 11 am – 1 pm   **Paper :** V   Full Marks : 50

Group – A

[Use a separate Answer Book for each Unit]

Unit – I

1. Define / Explain (**any six**): [6 × 1]
   a) API Gravity
   b) Aniline point
   c) Fire point
   d) Flash point
   e) Pour point
   f) Doctor test
   g) Octane number
   h) Cetane number
   i) VI index
   j) Detonation

2. Answer **any three** questions (short type answer): [3×3]
   a) Write the function of reforming operation used in the refinery. Write the feedstock used for reforming operation. [2 + 1]
   b) Discuss the reactions involved in the reforming operation. [3]
   c) (i) What is Viscosity Index?
      (ii) How is Viscosity Index calculated? [1+2]
   d) (i) Write the function of desulfurization process used in refinery.
      (ii) Write the catalyst and reactions involved in it. [1+2]
   e) (i) What is the function of a catalyst in a chemical reaction?
      (ii) Why a reaction is speeded up in presence of a catalyst?
      (iii) What is meant by poisoning of catalyst? [1+1+1]
   f) (i) What is meant by knocking?
      (ii) How is ISO-Octane prepared?
      (iii) What is mean by octane number of a gasoline? [1+1+1]

3. Answer **any three** questions (Long type answer): [3×5]
   a) Outline the steps involved in the distillation of crude oil. Lists the fractions in order of increasing boiling points and state at least one use of the different fractions. [3 + 2]
   b) Describe the fluidized bed cracking process in detail (with neat sketch). [5]
   c) How do you calculate the following thermal properties of petroleum? [5]
      (i) Thermal conductivity
   (ii) Heat of combustion
      (iii) Specific heat

d) Name the important properties to be measured for [2.5×2]
   (i) Gasoline
   (ii) Diesel
e) Discuss the manufacturing process of petroleum coke in detail. [5]
f) Give the present scenario of petroleum reserves in the world by a Pie chart which are the major petroleum producing countries in the world? Give a future projection of Indian Petroleum Industry. [1½+1½+2]

Unit – II
Answer **any five** [5×4]

4. a) (i) Write the names of nitrating agents used for nitration reaction.
      (ii) Write the nitration reaction with n-pentane and benzene. [2 + 3]
   b) How Acetylene is separated from ethylene in the ethylene manufacturing unit? Discuss in detail with flow sheet. [2 + 3]
   c) Discuss the advantages and disadvantages of photochemical vs catalytic route of chloromethane manufacturing process. [5]
   d) (i) What is meant by hydrogenation of fats.
      (ii) Discuss some uses of hydrogen in industry. [3+2]
   e) Discuss the chloromethane manufacturing process in detail. Write the reactions involved in the process. [3+2]
   f) (i) What is meant by the term D.V.S in the context of nitration. [1]
      (ii) Calculate the D.V.S value of the mixed acid used in the following reaction. [4]

   $$C_3H_5(OH)_2 + 3HNO_3 \rightarrow C_3H_5(ONO_2)_3 + 3H_2O$$
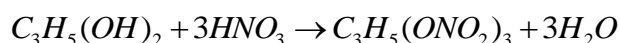
   Mixed acid composition.
   Total H_2SO_4 — 49.99%
   Total HNO_3 — 52.44%
   Actual H_2SO_4 — 49.90%
   Actual HNO_3 — 52.38%
   $HNOSO_4$ — 0.12%
   H_2O — (–) 2.40%

   In this reaction a nitric acid ratio of 2.30 is used. Assume a value of 1% of moisture in the actual glycerine.

   g) Define with examples and equations of the following terms: [3+1+1]
      (i) Sulfonation and Sulfation.
      (ii) What is N-Sulfonate?
      (iii) What are the commonly used materials of construction of a sulfonator?

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