DCD-12   Seat No. _____

B. Sc. (Sem. II) (CBCS) Examination

July - 2022

BS-IC-201 : Industrial Chemistry

Time : **2½** Hours]   [Total Marks : **70**

Instructions : (1) Question paper carries total 5 questions.
(2) All questions are compulsory and carry 14 marks each.
(3) Draw a labeled diagram wherever necessary.
(4) Assume suitable data.

**1** (a) Answer the following questions :   **4**

(1) Enlist various operating systems of the computer.

(2) Enlist various MS-Office software.

(3) Define: Fuel with example.

(4) Write reaction for combustion of fuel.

(b) Answer in brief : (any one out of two)   **2**

(1) Write applications for the internet.

(2) Write advantages of solid fuel.

(c) Answer in detail : (any one out of two)   **3**

(1) Draw a diagram of the computer system.

(2) Draw only diagram of Bomb calorimeter.

(d) Write a note on : (any one out of two)   **5**

(1) Write domestic as well as industrial applications of the computer system.

(2) Explain the classification of boiler in detail.

2 (a) Answer the following questions :   **4**

(1) Define: Adsorbate

(2) Enlist types of adsorptions.

(3) What do you mean by catalyst and how it works?

(4) Elaborate the word: Dispersion medium

(b) Answer in brief : (any one out of two)   2

    (1) Enlist applications of adsorption.

    (2) Draw only diagram of dialysis.

(c) Answer in detail : (any one out of two)   3

    (1) Explain factors affecting adsorption.

    (2) Explain applications of catalysis with examples and definitions.

(d) Write a note on : (any one out of two)   5

    (1) Write Langmuir adsorption isotherm in detail.

    (2) Discuss chemical method for the preparation of colloidal solution.

3 (a) Answer the following questions :   4

    (1) Define: Stoichiometric co-efficient.

    (2) Define: Specific Heat

    (3) Which reactants disappear first if reaction goes to completion?

    (4) _____ is the theory of the proportions in which chemical species combine with one another.

(b) Answer in brief : (any one out of two)   2

    (1) Define :
       (i) Specific Heat
       (ii) Heat of Formation

    (2) State the Hess's Law of Constant Heat Summation.

(c) Answer in detail : (any one out of two)   3

    (1) Ammonia is produced by the following reaction: $N_2 + 3H_2 \rightarrow 2NH_3$ Calculate (a) The molal flow rate of hydrogen corresponding to the nitrogen feed rate of 25 kmol/h if they are fed in the stoichiometric proportion. (b) The kg of ammonia produced per hour if percent conversion is 25 and nitrogen feed rate is 25 kmol/h

    (2) Derive relationship between Cp and Cv for an ideal gas.

(d) Write a note on : (any one out of two) **5**

    (1) The carbon monoxide is reacted with hydrogen to produce methanol. Calculate from the reaction: (a) The stoichiometric ratio of H_2 to CO. (b) kmol of CH_3OH produced per kmol CO reacted. (c) The weight ratio of CO to H_2 if both are fed to a reactor in stoichiometric proportion. (d) The quantity of CO required to produce 1000 kg of CH_3OH.

       Reaction : $CO + 2H_2 \rightarrow CH_3OH$
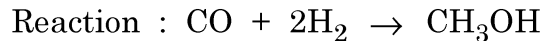
    (2) A stream of carbon dioxide flowing at a rate of 100 kmol/min is heated from 298 K (25 °C) to 383 K (110 °C). Calculate the heat that must be transferred using $Cp°$ data given below.
Data : $Cp° = a + bT + cT^2 + dT^3$, kJ/(kmol-k)

       Where $a = 21.3655$, $b = 64.2841 \times 10^{-3}$, $c = -41.0506 \times 10^{-6}$, $d = 9.799 - 10^{-9}$

4 (a) Answer the following questions : **4**

    (1) In which process particles are formed from homogeneous phase?

    (2) _____ result into formation of less number of nuclei and hence large size crystals are formed.

    (3) Which of the following is an example of unit operation?

    (4) Which of the following is an advantage of drum dryer?

(b) Answer in brief : (any one out of **two**) **2**

    (1) Define: Filtration, Solid cake and filtrate

    (2) Define: (1) Free moisture content (2) Humidity

(c) Answer in detail : (any one out of two) **3**

    (1) Enlist the characteristics of filter media.

    (2) Discuss factors affecting rate of drying.

(d) Write a note on : (any one out of two) **5**

    (1) Explain tubular bowl in detail.

    (2) Discuss fluidized bed dryer with schematic diagram.

5 (a) Answer the following questions : **4**

    (1) Which flow current is generated in shaft which is parallel to the axis?

    (2) Which mixer is used for free-flowing solid materials?

    (3) Give full form of NPSH

    (4) Priming is removed from pump by providing _____

  (b) Answer in brief : (any one out of two) **2**

    (1) Define: Mixing with example

    (2) Draw only diagram of piston pump.

  (c) Answer in detail : (any one out of two) **3**

    (1) Enlist various common heat transfer equipment used in industries.

    (2) Differentiate between reciprocating and centrifugal pump.

  (d) Write a note on : (any one out of two) **5**

    (1) Explain shell and tube heat exchanger with neat diagram.

    (2) Write a detailed note on fans with diagrams.

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