7630

BOARD DIPLOMA EXAMINATION, (C-20)

OCTOBER/NOVEMBER—2023

DCHST – FIFTH SEMESTER EXAMINATION

THERMODYNAMICS AND REACTION ENGINEERING

Time : 3 Hours]   [*Total Marks* : 80

PART—A   3×10=30

Instructions : (1) Answer **all** questions.

                (2) Each question carries **three** marks.

                (3) Answers should be brief and straight to the point and shall not exceed five simple sentences.

1. Define and classify thermodynamic system.

2. Differentiate between internal energy and heat capacity.

3. Define reversible process and write its characteristics.

4. State 2nd law of thermodynamics.

5. Define entropy and mention its units.

6. Define reaction coordinate.

7. Define and classify refrigerant.

8. Define zero order reaction with examples.

9. Define rate constant k and write its units.

10. Define autocatalysis with example.

PART—B

8×5=40

Instructions : (1) Answer **all** questions.

(2) Each question carries **eight** marks.

(3) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

11. Derive an expression for first law of thermodynamics for a closed system.

8

(OR)

Calculate ΔU, ΔH, Q and W for one g-mole ideal gas which is cooled from 140 °C to 65 °C at constant pressure process. Given $C_P = (5/2)R$, $C_v = (3/2)R$ and $R = 8.314$ J/g-mole K.

8

12. Explain Carnot cycle principle for a heat engine with a neat diagram.

8

(OR)

State the fundamental property relations for homogeneous phases.

8

13. Explain the vapour compression refrigeration cycle with a neat diagram.

8

(OR)

Explain Linde liquefaction process with a neat sketch.

8

14. The rate constant of a reaction at 27 °C is $1 \cdot 3 \times 10^{-3} \sec^{-1}$. Determine the frequency factor. Take activation energy $E = 12817$ cal/mol. $R = 1 \cdot 987$ cal/mol K.

8

(OR)

Explain the differential method of analysis of batch reactor data.

8

15. Explain the function of promoter, carrier, accelerator and inhibitor in catalytic reaction.

8

(OR)

(a) Define and classify catalysis.

4

(b) Explain the characteristics of a catalytic reaction.

4

2

PART—C

10×1=10

Instructions : (1) Answer the following question.

(2) The question carries **ten** marks.

(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

16. *(a)* Explain the importance of compressibility factor chart. 6

(b) Explain the variables which affect the rate of reaction. 4

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