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Question Paper Code: U3D03

B.E./B.Tech. DEGREE EXAMINATION, APRIL 2024

Third Semester

Biotechnology

21UBT303- APPLIED THERMODYNAMICS FOR BIOTECHNOLOGISTS

(Regulations 2019)

Duration: Three hours

Maximum: 100 Marks

Answer All Questions

PART A - (10x 2 = 20 Marks)

1. State the zeroth law of thermodynamics. CO1- U
2. Differentiate state and path function. CO1- U
3. Predict the relationship between activity and activity coefficient. CO2- App
4. Calculate the temperature at which 0.654 moles of neon gas occupies 12.30L at 1.95 atm. CO2- App
5. Analyze the problems encountered during phase equilibrium. CO3- Ana
6. Define bubble point temperature. CO1- U
7. Define extent of reaction. CO1- U
8. Define available energy. CO1- U
9. Identify anabolic products. CO1- U
10. Define yield coefficient. CO1- U

PART – B (5 x 16= 80Marks)

11. (a) Zia is a Mechanical Engineering student who is unaware of the engine having 100% efficiency. You as a Chemical engineer, elucidate the principle, proportions and working of such engines for him. CO1- U (16)
Or
(b) Explain the laws of thermodynamics with the corresponding derivations. CO1- U (16)
12. (a) Explain the partial molar properties of a solution with general equations. CO1- U (16)

Or

(b) Discuss the Gibbs-Duhem equation and its various forms and analyze its application in various fields. CO1- U (16)

13. (a) Illustrate the phase diagrams for binary solutions considering constant pressure equilibria and constant temperature equilibria. CO2- App (16)

Or

(b) Sketch the V-L equilibrium for azeotropic solution and explain in detail about azeotropic mixture. CO2- App (16)

14. (a) Explain the role of equilibrium constant and analyze the effect of temperature on equilibrium constant. CO3- Ana (16)

Or

(b) Analyze the methods for evaluation of equilibrium constants. CO3- Ana (16)

15. (a) Explain the thermodynamics of microbial growth CO1- U (16)

Or

(b) Explain the stoichiometry of microbial growth and product formation CO1- U (16)