JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATIONS-2022

B.Tech-III Semester (BT)

COURSE CODE (CREDITS): 18B11BT313(4) MAX. MARKS: 25

COURSE NAME: Thermodynamics and Chemical processes

COURSE INSTRUCTORS: Dr. Poonam Sharma MAX. TIME: 1 Hour and 30 Minutes

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Note: *All questions are compulsory. Marks are indicated against each question in square brackets.*

Q1. Absolute or 100% ethanol is produced from a mixture of 95% ethanol and 5% water using the Keyes distillation process. A third component, benzene, is added to lower the volatility of the alcohol. Under these conditions, the overhead product is a constant-boiling mixture of 18.5% ethanol, 7.4% H_2O and 74.1% benzene. Use the following data to calculate the volume of benzene which should be fed to the still in order to produce 250 litres. Absolute ethanol: (density 100% alcohol = 0.785 g cm^{-3}) ; (density benzene = 0.872 g cm^{-3}). Draw flow chart and Mass-balance table only. 5[COII]

Q2. A mixture (A) (125 kg) contains 2.5% invert sugars and 50% water; rest can be considered as solids. Another mixture (B) (45 kg) containing 50% sucrose, 1% invert sugars, 18% water and the remainder solids. Both mixtures A and B mixed together in mixing tank. Water is also added as separate component. Final product containing 2% invert sugars as one component is obtained.

(i) How much water is required?

(ii). What is the concentration of sucrose in final product? 7[COII]

Q3(a). Differentiate between reaction kinetics and reaction thermodynamics 3[COI]

(b). Convert 2 moles of oxygen to mass of oxygen. 3[COII]

Q4(a). For the following chemical equation

$$CH_3COOH + NH_3 \rightarrow CH_{1.4}O_{0.40}N_{0.20} + CO_2 + H_2O + CH_4.$$

Calculate maximum possible yield of biomass and maximum possible yield of product.

5[COII]

(b). Explain law of increase of entropy. 2[COI]