

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- 2023

B.Tech- III Semester (BT)

COURSE CODE (CREDITS): 18B11BT313 (4)

MAX. MARKS: 25

COURSE NAME: Thermodynamics and Chemical Processes

COURSE INSTRUCTOR: Dr. Poonam Sharma

MAX. TIME: 1 Hour 30 Minutes

Note: (a) All questions are compulsory.

(b) Marks are indicated against each question in square brackets.

(c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

- Q1(a). Describe different types of thermodynamic processes. 3[COI]
- (b) How the Michaelis-Menten constants are determined? 3[COIII]
- (c). Explain degree of reduction, Theoretical oxygen demand, and maximum possible yield of biomass. 4[COIII]
- Q2(a). Draw the proper flow sheet and mass balance table for the following material balances:
Acetobacter aceti bacteria convert ethanol to acetic acid under aerobic conditions as shown below. A continuous fermentation process for vinegar production is proposed using non-viable *A. aceti* cells immobilised on the surface of gelatin beads. The production target is 2 Kg h⁻¹ acetic acid, however the maximum acetic acid concentration tolerated by the cells is 12 %. Air is pumped into the fermenter at a rate of 200 gmol h⁻¹.
- $$C_2H_5OH + O_2 \rightarrow CH_3COOH + H_2O$$
- 4[COIV]
- (b). In the given equation, balance the atoms. 4[COIV]
- $$C_6H_{12}O_6 + aO_2 + bNH_3 \rightarrow cCH_{1.06}O_{0.54}N_{0.26} + dH_2O + eH_2O$$
- Q3. 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 a 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[COIV]