

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2023

B.Tech-III Semester (BT)

COURSE CODE (CREDITS):18B11BT313

MAX. MARKS: 35

COURSE NAME: Thermodynamics and Chemical Processes

COURSE INSTRUCTORS: Dr. Poonam Sharma

MAX. TIME: 2 Hours

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

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- Q1(a). Discuss the factors which affect the first law of thermodynamics. 3[COI]
(b). Explain Couette flow and Newton's Law of viscosity. 3[COV]
- Q2(a). Heat is transferred from one fluid to a second fluid across metal wall. The film coefficients are 1.2 and 1.7 $\text{KWm}^{-2}\text{K}^{-1}$. The metal is 6 mm thick and has a thermal conductivity of 19 $\text{W m}^{-1}\text{K}^{-1}$. On one side of the wall there is scale deposit with a fouling factor estimated at 830 $\text{Wm}^{-2}\text{K}^{-1}$. Calculate the overall heat transfer coefficient. 5 [COV]
(b). Discuss the impact of baffle arrangements in mixing equipment. 3[COV]
- Q3(a). Elaborate coupling reactions. 3[COII]
(b). Discuss how viscosity is calculated in an impeller viscometer. 4[COV]
- Q4(a). Elaborate the working of single pass shell and tube heat exchanger. 4[COVI]
(b). Convert 200 gmol^{-1} (moles) of air into amount of oxygen and nitrogen (mass). 4[COVI]
- Q5. From the following data:
- | Shear stress (dyne cm^{-2}) | Shear rate (s^{-1}) |
|--|--------------------------------|
| 44.1 | 10.2 |
| 235.3 | 170 |
| 357.1 | 340 |
| 457.1 | 510 |
| 636.8 | 1020 |
- (a) Plot the rheogram for this fluid.
(b) Determine the appropriate non-Newtonian parameters.
(c) What is the apparent viscosity at shear rates of 15 s^{-1} 6[COV]