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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST 3 EXAMINATION- DEC. 2021
B.Tech (BT) III[rd] Semester

COURSE CODE: 18B11BT313 MAX. MARKS : 35
COURSE NAME: Thermodynamics and Chemical processes
COURSE CREDITS: 4 MAX. TIME: Two Hours

Note: *All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.*

Q1(a). Elaborate how electron transfer via redox reactions generates biological energy. 2

(b). What are the criteria for the spontaneous nature of chemical reaction? Give examples. 3

Q2(a). Elaborate different factors which affect broth viscosity. 5

(b). Differentiate between 4

(i) Thermal boundary layer and Fouling layer.

(ii) Heat Transfer and Heat flux

Q3. Corn steep liqour (125 kg) contains 2.5% invert sugars and 50% water; rest can be considered as solids. Beet molasses (45 kg) containing 50% sucrose, 1% invert sugars, 18% water and the remainder solids. Both mixtures mixed together in mixing tank. Water is also added as separate component. Final product containing 2% invert sugars as one component is obtained. 5

Q4(a) Discuss the single shell and tube pass heat exchanger. 5

(b). Discuss how the rheological behavior is responsible for classification of fluids. 5

Q5. The rheology of a Penicillium chrysogenum broth is examined using an impeller viscometer. The density of the cell suspension is approximately 1000 kg m^{-3} . Samples of broth are poured into a glass beaker of diameter 15 cm and stirred slowly using a Rushton turbine of diameter 4 cm and value of K =10.2. When the stirrer shaft is attached to a device for measuring torque and rotational speed, the following results are recorded.

Stirrer speed (s^{-1})	Torque (N m)
0.185	3.57×10^{-6}
0.163	3.45×10^{-6}
0. 126	3.31×10^{-6}
0. 111	3.20×10^{-6}

Can the rheology be described using a power-law model? If so, evaluate K and n. 6