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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST 3 EXAMINATION- DEC. 2018
B.Tech (BT) III[rd] Semester

COURSE CODE: 10B11BT311 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). What are the criteria for the spontaneous nature of chemical reaction? Give examples. 3 [CO I]

(b). Elaborate how electron transfer via redox reactions generates biological energy. 2 [CO II]

Q2. Initial rate data is listed below. Calculate Vmax and Km

Lactose concentration (mol l^{-1} X 10^{2})	Initial reaction velocity (mol l^{-1} min^{-1} X 10^{5})
2.50	1.94
2.27	1.91
1.84	1.80
1.35	1.80
1.25	1.78
0.730	1.46

Q3(a). Elaborate different factors which affect broth viscosity. 5 [CO III]

(b). Differentiate between 5 [CO V]

(i) Thermal boundary layer and Fouling layer 4 [CO VI]

(ii) Rate of Heat Transfer and Heat flux

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

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

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. 5 [CO V]

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

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

(b) Viscosity measurements using impeller viscometers must be carried out under laminar flow conditions. Check that flow in this experiment is laminar.

6 [CO V]