CBCS Scheme

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First Semester M.Tech. Degree Examination, Dec.2017/Jan.2018
Principles of Biochemical Engineering

Time: 3 hrs.   Max. Marks: 80

Note: 1. *Answer FIVE full questions, choosing one full question from each module.*
2. *Draw figure wherever necessary.*
3. *Missing data may be assumed.*

Module-1

1 Discuss in brief how Biologists and Engineers differs in their approach towards any Research in general, with a suitable example.   **(16 Marks)**

OR

2 Explain the various stages involved in a typical biological process. Also explain the advantages and disadvantages of the Biological process.   **(16 Marks)**

Module-2

3 a. State and explain the Crushing law available for assessing the power requirement for seize reduction of particle.   **(06 Marks)**
   b. Derive the expression of calculation of power NO in a mixing process using Dimensional Analysis.   **(10 Marks)**

OR

4 a. Explain the construction and working principle of following equipments :
   i) Jaw crusher   ii) Rotary Drum filter.   **(10 Marks)**
   b. 30 kW of power has to be supplied to a machine, crushing the material at the rate of 0.1kg/sec from 12.5mm to a product having the seize distribution given in the following table. What would be the power consumed by the same machine to crush the sample (same) at same rate from 50mm to 10mm (use Rittengeirs law).   **(06 Marks)**

Mass fraction	80%	10%	10%
Product Seize	3.162mm	2.5mm	2.25mm

Module-3

5 Starting from force balance derive the expression of movement of solids in a stationery fluid under Newtons, stokes and intermediate regions.   **(16 Marks)**

OR

6 a. A gas is flowing through a horizontal pipe, which is having area of cross – section as 40cm^2, where pressure is 40N/cm^2 (gauze) and temperature 15^{0}C. At another section the area of cross – section is 20cm^2 and pressure is 30N/cm^2 (gauze) if the mass rate of flow of gas through the pipe is 0.5kg/sec. Find the velocity of gas at these sections assuming the Isothermal change. Take R = 292 NM/kg^0 K and atmospheric pressure = 10N/cm^2.   **(08 Marks)**
   b. Derive the continuity equation for the flow of fluid whose velocity is varying in x, y, z directions. Hence deduce the same equation for steady.   **(08 Marks)**

Module-4

7 How water at a rate of 5000 kg/hr, 500K has to be cooled using an heat exchanger. It is cooled with the help of cold water @ 10,000 kg/hr at a temperature of 300K. Determine the following :
  i) Total entropy change of the system .
  ii) If the engine is expected to operate between interphase of Hot water and cold water. Determine the feasibility of engine.
  iii) Work lost in a process of Heat transfer. **(16 Marks)**

OR

8 a. Obtain the differential equation of entropy for constant temperature, pressure, volume processes. **(08 Marks)**
  b. Write brief note on : i) Gibbs free energy   ii) Helmoltz free energy. **(08 Marks)**

Module-5

9 a. Write brief note on LMTD and its calculations. **(08 Marks)**
  b. Explain the concept of Pool boiling nature of saturated liquid, with the neat sketch. **(08 Marks)**

OR

10 Explain the Construction , Working principle of DPHE and STHE, with the neat sketch. Also with Heat transfer equations. **(16 Marks)**

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