GIET UNIVERSITY, GUNUPUR – 765022
B. Tech (Fourth Semester – Regular) Examinations, June – 2021
BPCBT 4040 – Upstream Process Engineering
(Biotechnology)

Time: 2 hrs   Maximum: 50 Marks

Answer ALL Questions
The figures in the right hand margin indicate marks.

PART – A: (Multiple Choice Questions)   **(1 x 10 = 10 Marks)**

Q.1. Answer *ALL* questions   [CO#]   [PO#]

a. Which of the following works on the principle of shearing?   1   1
   - (i) Ball mill
   - (ii) Roll crusher
   - (iii) Toothed crusher
   - (iv) Rod mill

b. The two basic methods of analysis are   1   1
   - (i) Cumulative and Affirmative
   - (ii) Cumulative and Frequency
   - (iii) Frequency and Affirmative
   - (iv) Affirmative and Conservative

c. The fluid will rise in capillary when the capillary is placed in fluid, if   2   1
   - (i) the adhesion force between molecules of fluid and tube is less than the cohesion between liquid molecules
   - (ii) the adhesion force between molecules of fluid and tube is more than the cohesion between liquid molecules
   - (iii) the adhesion force between molecules of fluid and tube is equal to the cohesion between liquid molecules
   - (iv) None of these

d. Which of the following is a shear-thickening fluid?   2   1
   - (i) Bingham plastic
   - (ii) Thixotropic
   - (iii) Dilatant
   - (iv) Pseudoplastic

e. What is the unit of viscosity of fluids in C.G.S?   2   1
   - (i) ml/s
   - (ii) l/s
   - (iii) Poise
   - (iv) Newton

f. Bernoulli's principle is derived from which of the following?   3   1
   - (i) Conservation of mass
   - (ii) Conservation of energy
   - (iii) Newton's law of motion
   - (iv) Conservation of momentum

g. The famous Fourier series is named after   3   1
   - (i) Diller and Ryan
   - (ii) J.B. Joseph Fourier
   - (iii) Stefan- Boltzmann
   - (iv) Wein's

h. For inclined plates we multiply Grashoff number with   3   1
   - (i) $\cos 2\alpha$
   - (ii) $\sin 2\alpha$
   - (iii) $\sin \alpha$
   - (iv) $\cos \alpha$

i. Find the permeability if diffusivity is 2 units and solubility coefficient is 5 units assume all are in SI units.   4   1
   - (i) 10 units
   - (ii) 1.5 units
   - (iii) 0.4 units
   - (iv) None of the mentioned

j. How is it possible to shift the equilibrium to advantage in azeotropic mixture?   4   1
   - (i) Changing the volume
   - (ii) Adding more mixture
   - (iii) Adding one of the component more
   - (iv) Changing the pressure.

PART – B: (Short Answer Questions)   **(2 x 5 = 10 Marks)**

Q.2. Answer **ALL** questions   [CO#]   [PO#]

a. Water flows between two plates of which the upper one is stationary and the low   1   2
    one is moving with a velocity V. What will be the velocity of the fluid in contact
    with the upper plate.

b. In a U-tube mercury manometer, one end is exposed to the atmosphere and the   2   2
    other end is connected to a pressurized gas. The gauge pressure of the gas is found
    to be 40 kPa. Now, we change the manometric fluid to water. The height difference
    changes by: (ρ mercury = 13600 kg/m^3, ρ water = 1000 kg/m^3)

c. Where does the maximum stress occur in case of laminar flow of incompressible   3   1
    fluid in a closed conduit of diameter "d"

d. What is critical insulation?   3   1

e. What is the difference between convective mass transport and diffusive mass   4   1
    transport

PART – C: (Long Answer Questions)   **(6 x 5 = 30 Marks)**

Answer **ANY FIVE** questions   Marks   [CO#]   [PO#]

3. Explain the properties and handling of particulate solids   (6)   1   1

4. Describe the working principle of pulveriser   (6)   1   1

5. List atleast four pressure measuring devices and explain working principle of   (6)   2   1
    any one.

6. State the principle and Derive Bernoulli equation for fluid flow.   (6)   2   1

7. Discuss about natural and forced convection.   (6)   3   1

8. Consider a parallel-flow heat exchanger, which is used to cool oil from 70°C to   (6)   3   2
    40°C using water available at 30°C. The outlet temperature of the water is 36°C.
    The rate of flow of oil is 1 kg/s. The specific heat of the oil is 2.2 kJ/kg K. The
    overall heat transfer coefficient U = 200 W/m^2 K. Calculate the logarithmic
    mean temperature difference. Determine the area of this heat exchanger required
    for this performance.

logarithmic mean temperature difference

T

70°C

ΔT_A
40°C

hot oil

40°C

ΔT_B
4°C

36°C

30°C

cooling water
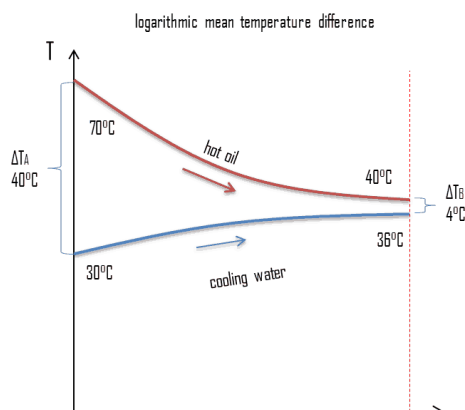
9. Explain Fick's law and its uses.   (6)   4   1

10. Write a note on flash vaporization   (6)   4   1

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