Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech (CT)/SEM-4/CHE (CT)-401/2010

2010

UNIT OPERATION-II

Time Allotted : 3 Hours Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$

i) Sphericity is defined as

a) 6 DpSp/Vp b) 6 Vp/DpSp

c) 6 Sp/VpDp d) none of these.

ii) The characteristic action of crusher is

a) compression b) impact

c) attrition d) none of these.

iii) Almost all hard solid communited by the mill

a) Cutter b) Roller

c) Hammer d) none of these.

iv) Capacity and effectiveness of screen are

a) opposing factor b) co-factor

c) not related d) none of these.

v) The most common type of Jaw crusher is

a) gyratory b) smooth-roll

c) black d) none of these.

vi) The unit of volumetric diffusion co-efficient is

a) m/s b) m^2/s

c) m^3/s d) none of these.

vii) The unit of mass transfer co-efficient is

a) kg/m^2-s

b) $kg.mol/m^2$-s

c) $kg.mol/m^2$-s-unit mol.fr

d) none of these.

viii) Clarifying fiters are generally used for

a) cake production b) flake product

c) gas cleaning d) none of these.

ix) Size range of 0·1 to 5 μm could be separated from slurry by

a) cake filtration b) clarifying filtration

c) micro filtration d) none of these.

x) Dryer used for production of fine ceramic powder from slurry is

a) tray dryer b) rotary dryer

c) spray dryer d) none of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. State the role of diffusion in different mass transfer operation. State the importance of diffusion in ceramic processing technology.
3. Derive an expression for equimolal counter diffusion under steady state condition.
4. Why is the angle between the toggle and pitmann in the Blake crusher kept nearly 90° ? Explain with neat sketch.
5. Discuss 'shrinkage' and 'case hardening' for drying of non-porous solid.
6. Explain the principle of mixing of heavy paste material.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. What is molecular diffusion ? Explain eddy diffusivity and mention the factors on which it depends. Hydrochloric acid vapour is diffusing across inert air film of 0·2 mm thick at a temperature 25°C and atmospheric pressure. Estimate the effect on the rate of diffusion in kg.mole/m^2.s, of raising the pressure upto 10 atmosphere, if the concentration of acid is 0·1 (N) and D_v = 0·51 ft^2/min at 25°C and atmospheric pressure. 7 + 8
8. What is the 'angle of Nip' for roll crusher ? Find out the theoretical capacity of roll crusher. The energy require to crush a material in a Blake Jaw crusher from 50 mm to 10 mm size is 13·0 kW/kg.sec. What will be the amount of energy needed to crush the same material of average size 75 mm to an average size 25 mm, assuming
   i) Rittinger's law
   ii) Kick's law ? 8 + 7

9. In adiabatic dryer, explain the different ways for solid handling. Woolen cloth is dried in hot air from an initial moisture content of 100% to a final moisture of 10% in 5 hrs. If the critical and equilibrium moisture contents under constant drying condition are 55% and 5% respectively, calculate the saving in time when the material is to be dried to 20% instead of 10% moisture content under the same drying conditions. All moisture contents are expressed on dry basis. 6 + 9

10. Explain the 'Mixing index' in blending of granular solids. Derive a correlation between mixing time and mixing index.

    Explain with sketch, how a ribbon blender operates.

    5 + 5 + 5

11. What are the different types of filtration process ? Explain the filter media characteristics. Mention the commonly used filter aids in industry.

    Explain Herman's and Bredee equation for filtration. Find out the correlation of time and flow rate of filtrate in clarifying filtration. (3 + 3 + 1) + 4 + 4