Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS / B.TECH (CT) / SEM-4 / CT-402 / 2011

2011

PROCESS CERAMICS – I

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 × 1 = 10

   i) Workability index is the measure of

   a) Porosity b) Water absorption

   c) Plasticity d) Strength.

   ii) Grinding mechanism *in vitro* energy mill is

   a) impact b) spinning

   c) rubbing d) all of these.

iii) The forming method used for saucer is

a) Slip casting b) Extrusion

c) Jiggering d) Jolleying.

iv) Chemical formula of gypsum is

a) $CaSO_4, \frac{1}{2}H_2O$ b) $CaSO_4, H_2O$

c) $CaSO_4, 2H_2O$ d) $CaSO_4, \frac{1}{3}H_2O$.

v) True density and bulk density will be equal when

a) apparent porosity is zero

b) closed porosity is zero

c) open and closed porosity is zero

d) none of these.

vi) Which oxide is not a glass network former ?

a) GeO_2 b) MgO

c) P_2O_5 d) B_2O_3 .

vii) The maximum packing efficiency achieved theoretically with unisized spherical ball is

a) 80% b) 75%

c) 74% d) 82%.

viii) Which statement is not correct ?

a) Alumina powder shows dilatant behaviour

b) Filter pressing prefers flocculated suspension

c) Plastic flow curve passes through the origin

d) Thixotrophic suspension shows hysteresis loop.

ix) Which one is the modifier in glass formation ?

a) P_2O_5 b) GeO_2

c) SiO_2 d) Li_2O .

x) Which is used as deflocculating agent in slip casting ?

a) NaOH b) NaCl

c) Na_2SiO_3 d) Na_2SO_4 .

GROUP – B

(Short Answer Type Questions)

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

2. Briefly describe the mechanism of flocculation and deflocculation of clay water system with neat sketch. Mention few applications where flocculated & deflocculated slips are used. 4 + 1

3. How does solid cast slip differ from drain cast slip ? Prove that for casting $L \alpha \delta t$ where L is the skin thickness & t is the casting time. 1½ + 3½

4. Why is powder granulation essential before pressing ? How do the spray dried granules differ from the granules by other method ? 3 + 2

5. Give the modern definition of glass with example. Plot sp. volume versus temperature of a glass forming liquid & crystal forming liquid and locate melting temp, glass transition region and fictive temp. 2½ + 2½

6. Define zeta potential and double layer potential. Narrate the effect of NaOH & NaCl addition to a H-clay on zeta potential. 3 + 2

GROUP – C

(Long Answer Type Questions)

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

7. Mention the objectives of firing stage in ceramic product manufacturing. Define sintering. What are the driving forces for sintering ? Briefly describe the different types of sintering in ceramic system. How does coarsening differ from densification ? 2 + 2 + (3 × 2½) + 3½

8. "Drying is an important operation prior to firing for materials shaped by slip casting and plastic forming." Explain. Discuss the different types of water present in clay containing paste. Briefly describe the drying mechanism of clay based body. "Drying of sanitary ware is done in humidity drier not in hot floor drier." Why ? Mention the different types of defects introduced due to incorrect drying practice. 3 + 4 + 4 + 2 + 2

9. Define bulk density, apparent porosity, packing fraction and packing efficiency. Discuss in detail the different ways of packing of unisized spherical particles. How porosity of packed bed can be reduced to a minimum ideally with different sized spherical particles ? Why are graded particles used for most of the ceramic body preparation ? 4 + 4 + 4 + 3

10. Draw the viscosity *vs* temperature curve for sodalime-silica glass and identify the annealing paint, stain point, softening point and working range on the curve and discuss their importance in glass processing. What is refining of glass ?

Describe the refining mechanism of any two refining agents. Give the approximate oxide composition of sheet glass, *w*-sealing glass & optical film. (4× 1½) + 2 + (2 × 2) + 3

11. Write short notes on any *three* of the following : 3 × 5

i) Extrusion method of forming

ii) Working principle of spray drier

iii) Isostatic pressing *v*s uniaxial pressing

vi) Attrition mill – advantages and disadvantages.

v) Firing of triaxial body.

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