



Name :

Roll No. :

Invigilator's Signature :

CS/B.TECH(CT)/SEM-6/CT-605/2012

2012

PROCESS CERAMICS-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) Alkali present in which technical Al_2O_3 available in the market is not removable by acid treatment ?
 - a) $\alpha - \text{Al}_2\text{O}_3$
 - b) $\beta - \text{Al}_2\text{O}_3$
 - c) $\gamma - \text{Al}_2\text{O}_3$
 - d) None of these.
 - ii) Most nano-materials are prepared by
 - a) Precipitation technique
 - b) Co-precipitation technique
 - c) Sol-Gel technique
 - d) Spray drying technique.
 - iii) Sealed pores are the result of
 - a) Pore mobility < Grain boundary mobility
 - b) Pore mobility > Grain boundary mobility
 - c) Pore mobility = Grain boundary mobility
 - d) None of these.



- iv) The porosity of the dried Colloidal gel is
- a) 30 % – 60 % b) 40 % – 50 %
- c) 10 % – 30 % d) 70 % – 80 %.
- v) Sintering of Polymeric gel is performed in the range of
- a) 800°C - 1000° C
- b) 1050° C - 1170° C
- c) 1200° C - 1500° C
- d) Above 1500° C.
- vi) Hard agglomerates are coarser, having
- a) Less packing density ; more firing shrinkage
- b) More packing density ; less firing shrinkage
- c) Less packing density ; less firing shrinkage
- d) More packing density ; more firing shrinkage.
- vii) Which of the following is/are prepared by Dry bag isostatic pressing and contour grinding ?
- a) Spark plug b) Insulators
- c) Oxygen sensors d) All of these.
- viii) For the particle size distribution $(20 - 1) \mu\text{m}$, Grinding rate is
- a) > 1.0 b) < 1.0
- c) 1.0 d) < 0.7 .
- ix) Suitable working lining of A. O. D. Unit is
- a) High alumina b) Burnt magnesite
- c) DBMC d) None of these.
- x) Which of the following is used for back up lining for LD Converter barrel zone and steel ladle slag zone ?
- a) $\text{MgO} - \text{Cr}_2\text{O}_3$ b) $\text{MgO} - \text{C}$
- c) MgO d) $\text{Al}_2\text{O}_3 - \text{ZrO}_2 - \text{SiO}_2$.



GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Describe morphological changes during solid state sintering.
3. Discuss briefly about mono-sized, mono-dispersed submicron ceramic powder.
4. Describe physical vapour deposition technique.
5. Discuss the effect of agglomeration of ceramic powders on sintering.
6. Differentiate between Colloidal gel and Polymeric gel.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7.
 - a) Define Co-precipitation technique for preparation of ceramic powder.
 - b) Describe how co-precipitation technique is used to prepare Magnesio-Aluminate spinel.
 - c) Discuss the effect of pH on the composition of Magnesio-Aluminate spinel.
 - d) Why ceramic powders made by precipitation technique are usually agglomerated ? $3 + 7 + 3 + 2$
8.
 - a) Define Sol-Gel technique for preparation of ceramic powder.
 - b) How does it differ from precipitation/co-precipitation technique ?
 - c) Describe briefly how sub-micron ceramic powders are prepared by Sol-Gel technique.
 - d) Why ceramic powders prepared by sol-gel route give better sinter ability than that prepared by co-precipitation technique ? $3 + 3 + 7 + 2$



9. a) Define solid state sintering.
b) Classify solid state sintering.
c) Calculate the number of particles of diameter 0.3 micron involved when they form bigger grain of diameter 3.0 microns.
d) A ceramic body has 3.0 gm/cc green density. During firing it gives sintered density 3.2 gm/cc. It shows firing weight loss of 4 wt. %. State whether the body will give shrinkage or expansion and also calculate the per cent linear expansion or shrinkage during firing.

3 + 3 + 3 + 6

10. a) What is the condition to stop the secondary grain growth during later stage of sintering ?
b) Define sintering additives.
c) How they differ from the green binders ?
d) Calculate briefly the driving force of solid state sintering.

What are the differences between solid state sintering and liquid state sintering ?

3 + 2 + 3 + 4 + 3

11. Write short notes on any *three* of the following : 3 × 5
- a) Definition and difference of tape casting from ordinary slip casting
 - b) Hot and Cold Isostatic pressing
 - c) Spray drying
 - d) Comparison of soft and hard agglomerate.
 - e) Intermediate stage of sintering.
 - f) Grain boundary diffusion.
