



Name :

Roll No. :

Invigilator's Signature :

**CS/B.TECH(CT)/SEM-4/CT-402/2010
2010**

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)

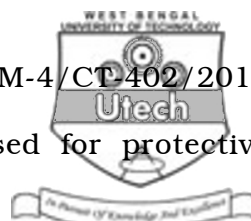
1. Choose the correct alternatives for the following :

10 × 1 = 10

- i) Ball mill should run at
 - a) 20 - 30% of its critical speed
 - b) 40 - 50% of its critical speed
 - c) 65 - 80% of its critical speed
 - d) none of these.
- ii) The chemical formula of Plaster of Paris is
 - a) $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
 - b) $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$
 - c) $\text{CaSO}_4 \cdot \text{H}_2\text{O}$.



- iii) Which of the factors control the plasticity of ceramic material ?
- a) Particle size
 - b) Particle size distribution
 - c) Shape of the particle
 - d) All of these
 - e) Only (a) & (b).
- iv) Which one does not show dilatancy ?
- a) Al_2O_3
 - b) Silica
 - c) Zircon
 - d) Montmorillonite.
- v) The value of zeta potential for stable suspension is
- a) ± 0.05 volt
 - b) ± 0.10 volt
 - c) ± 1.0 volt
 - d) none of these.
- vi) Vitrification takes place in firing of
- a) refractory body production
 - b) bio-ceramic body preparation
 - c) dielectric ceramic production
 - d) whiteware body production.
- vii) Which of the following oxides is not glass network former ?
- a) B_2O_3
 - b) GeO_2
 - c) P_2O_5
 - d) CaO .
- viii) Which statement is incorrect ?
- a) Vitreous silica is an amorphous material
 - b) To ease filterpressing flocculated suspension is preferred
 - c) Sintering temperature should not be less than 2/3rd of melting temperature
 - d) Sanitary wares are dried in hot floor drier.



- ix) Which of the following can be used for protective colloid ?
- | | |
|--------------------|----------------------|
| a) Sodium chloride | b) Sodium carbonate |
| c) Sodium silicate | d) Sodium hydroxide. |
- x) Which chemical is used as fining agent for glass melting ?
- | | |
|---------|-------------------------------|
| a) NiO | b) CoO |
| c) NaCl | d) Na_2CO_3 . |

GROUP – B

(Short Answer Type Questions)

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

- Give the modern definition of glass. Write down the approx. oxide composition of soda lime silica glass, pyrex glass & crown optical glass.

$$3 \frac{1}{2} + \left(\frac{1}{2} \times 3 \right)$$
- Define plasticity. Name the different factors with example to control plasticity of clay. What is Atterberg no. of plasticity ?

$$1 \frac{1}{2} + 2 \frac{1}{2} + 1$$
- Neatly draw the double layer formation of clay-water system. What are double layer potential and zeta potential ?

$$2 + \left(1 \frac{1}{2} \times 2 \right)$$
- Describe the working principle of a spray drier with a sketch. What are the main advantages of spray dried granules ?

$$3 \frac{1}{2} + 1 \frac{1}{2}$$
- Name the different shaping processes used in ceramic system. How do they differ from each other ? Why powder granulation is essential for pressing ?

$$1 \frac{1}{2} + 1 \frac{1}{2} + 2$$



GROUP – C

(Long Answer Type Questions)

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

7. What are the objectives of firing in ceramic processing ? Briefly describe the deficient stages of ceramic firing. What are the driving force of sintering ? Explain with example how does vitrification differ from liquid phase sintering.
 $2 + 6 + 3 + 4$
8. Describe the different types of water present in clay paste. Briefly state the drying mechanism of clay containing body. Give the names of different methods of dyeing. Discuss the working principle of humidity drier. Mention the types of defects introduced in pottery body due to incorrect dyeing practices.
 $3 + 4 + 1 \frac{1}{2} + 2 \frac{1}{2} + 4$
9. Draw the expansion verses temperature curve of a well annealed glass sample and locate and define the following points on the curve. (i) T_u (ii) T_s & (iii) T_d . What is critical cooling rate of glass ? State the different types of raw materials and their functions in soda-lime-silica glass manufacturing. Describe briefly what size specification & impurities of glass sand are permissible for glass production. What types of problems will arise if coarser or finer glass sand particles are used for glass production ?
 $6 + 4 + 3 + 2$
10. Define bulk density, packing fraction & packing efficiency. State the different types of porosity present in a ceramic body. How are they formed in a body ? Describe the different ways of packing of unisized spherical particles mentioning their packing efficiency & co-ordination number. Why graded materials are desirable for ceramic processing ?
What is quartile ratio ? $3 + 1 \frac{1}{2} + 3 + 4 \frac{1}{2} + 2 + 1$
11. Write short notes on any *three* of the following : $3 \times 5 = 15$
 - i) Jiggering & Jolleying
 - ii) Isostatic pressing
 - iii) Deairing pug mill
 - iv) Attrition mill & its advantages
 - v) Solid state sintering.