Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH(CT)/SEM-6/CT-602/2012

2012

GLASS – 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 × 1 = 10

i) The refractory of choice for throat and doghouse is

a) high $Al_2 O_3$ b) ZrO_2 –mullite

c) Fused mullite d) Fused cast AZS.

ii) $Al_2 O_3$ content in sillimanite is approx.

a) 16% - 19% b) 36% - 39%

c) 50% - 60% d) 65% - 70%.

iii) Which of the following temperature ranges of melting and refining for the glass is chosen for glass-ceramic production ?

a) 1400°C – 1500°C

b) 1500°C – 1600°C

c) 1200°C – 1300°C.

iv) Which of the following oxides reduces the viscosity of the glass most ?

a) $Li_2 O$ b) $Na_2 O$

c) CaO d) $K_2 O$.

v) Which of the following oxide combinations will be chosen for glass-ceramic production ?

a) $K_2 O – Al_2 O_3 – SiO_2$

b) $MgO – Al_2 O_3 – SiO_2$

c) $Na_2 O – CaO – SiO_2$.

vi) The optical glass is called crown glass when the Abbe no. is

a) 50 or below

b) 55 or above

c) between 50 and 55.

vii) To favour heterogeneous nucleation the contact angle (θ) should be

a) $\theta \leq 90^\circ$ b) $\theta \leq 180^\circ$

c) $\theta \geq 180^\circ$ d) $\theta \geq 90^\circ$.

viii) Good nucleating agend as metal for ceramization of glass is

a) Mg b) Pb

c) Cu d) Al.

ix) High concentration of Sb_2O_3 along with which of the following oxids makes the glass opaque ?

a) BaO b) Fe_2O_3

c) As_2O_3 d) B_2O_3 .

x) The best oxide nucleating agent mostly used in glass-ceramic production is

a) P_2O_5 b) Fe_2O_3

c) PbO d) TiO_2 .

GROUP – B

(Short Answer Type Questions)

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

2. Define glass-ceramics. How does it differ from traditional ceramics and glass ? Devitrification not ceramization of glass. Why ? 1 + 2 + 2

3. What do you mean by refining of glass melt ? Why is it necessary in glass making ? Which glass batch raw materials help and which obstruct in refining and why ?

1 + 1 + 3

4. Define solarization. Briefly discuss the mechanism of solarization with example.

5. Briefly describe the technological importance of glass-ceramics.

6. Define optical dispersion of light. What is Abbe no. ? Briefly narrate the different factors controlling the R.I. of glass.

GROUP – C

(Long Answer Type Questions)

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

7. Describte the chemical property and total porosity requirement for the refractories for glass melting fernaces. Draw the $Al_2 O_3 - SiO_2$ phase diagram and describe that part which is relevant to the glass tank furnace refractiories. Briefly describe the development of glass tank refractories. 3 × 2 + 5 + 4

8. Describe the chemical stability and crystallization characteristics of glasses for selection of composition for glass-ceramic production. Give the mechanisms of nucleation by photosensitive reaction. Draw the MOR value of LAS glass-ceramic as a function of *UV* radiation dose and grain size. 4 + 4 + 5 + 2

9. Derive the thermodynamic expression with free energy *vs* temperature and phase diagram for phase separation for exothermic and endotherms mixing. Draw the immiscibility dome and spinodal dome and explain in brief. How does glass-in-glass phase separation by spinodal decomposition differ from nucleation and growth. 6 + 5 + 4

10. Write short notes on any *three* of the following : 3 × 5
    a) Raw materials for glass batch major and minor constituents
    b) Photosensitive and photochromatic glass
    c) LAS glass ceramics
    d) Mechanism of development of amber colour in glass
    e) Toughening of glass.