Name : ....

Roll No. : ....

Invigilator's Signature : ....

CS/B.Tech(CT/OLD)/SEM-6/CT-602/2013

2013

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 :

$$10 \times 1 = 10$$

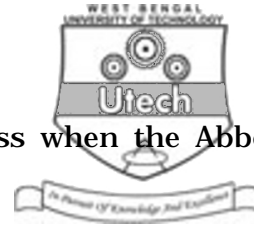   i) Al_2O_3 content in sillimanite is approx imately

   a) 16% – 19%   b) 36% – 39%

   c) 50% – 65%   d) 65% – 70%.

   ii) Abble number is

   a) $\dfrac{n_D - 1}{n_F - n_C}$ b) $\dfrac{1 - n_D}{n_F - n_C}$

   c) $\dfrac{n_D - 1}{n_C - n_F}$ d) $\dfrac{n_F - 1}{n_F - n_C}$.

   iii) The major crystalline phase in machinable glass ceramics is

   a) Fluorophlogopite   b) Margrite

   c) Phlogopite   d) Paragonite.

6127 (O)   [Turn over

iv) The optical glass is called crown glass when the Abbe No. is

a) 50 or below

b) 55 or below

c) between 50 – 55.

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

a) $K_2O – CaO – SiO_2$

b) $MgO – Al_2O_3 – SiO_2$

c) $Na_2O – CaO – SiO_2$.

vi) Good nucleating agent as metal for ceramization of glass is

a) Mg 　　　　　　　b) Si

c) Al 　　　　　　　d) Pt.

vii) The good oxide nucleating agent mostly used in glass-ceramic production is

a) P_2O_5 　　　　　　b) PbO

c) TiO_2 　　　　　　d) CaO.

viii) Which of the following oxides reduces the viscosity of the glass melt most ?

a) K_2O 　　　　　　b) Al_2O_3

c) Li_2O 　　　　　　d) CaO.

ix) The crown of the glass tank furnance is made up of

a) Al_2O_3 b) SiO_2

c) MgO   d) ZrO_2 .

x) Refractive index (RI) of a glass is dependent on

a) melting temperature of glass

b) annealing temperature

c) electron density/polarizability of the ions

d) none of these.

GROUP – B
(Short Answer Type Questions)
Answer any *three* of the following.   3 × 5 = 15

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

3. Define glass-ceramic. How does it differ from traditional ceramics & glass ?   2 + 3

4. What do you understand by refining of glass melt ? Why is it important in glass making ? Name two refining agents.

$$1\tfrac{1}{2} + 1\tfrac{1}{2} + 2$$

5. Give the expression of molar refractivity with R.I. How is molar refractivity of a compound *Ax* By related to ionic refractivity ? Why do chaleogenide glasses have high refractivity ?   1 + 2 + 2

GROUP – C
(Long Answer Type Questions)
Answer any *three* of the following.   3 × 15 = 45

6. Draw & explain the specific volume *vs* temperature plot of a melt during cooling. Define fictive temperature. Draw & describe the viscosity as a function of temperature plot of a sodalime-silica glass melt & locate the strain point, working point and softening point. Discuss the significance of working range and annealing range in commercial glass production. $3 + 1 + 6 + (2 \times 2\frac{1}{2})$

7. Briefly narrate the thermodynamic basis for phase separation. How does phase separation by nucleation & growth process differ from spinodal decomposition ? Describe how the melting / shaping and crystallization characteristics of glasses control the processing of glass ceramics. $5 + 5 + (2 \times 2\frac{1}{2})$

8. Glasses based on BeF_2 have low R.I. (1·27) whereas vitreous silica & B_2O_3 have high R.I. (1·45). Why ? Draw and explain the effect of different alkali oxides on R.I. of glass. Define optical dispersion and mean dispersion. Briefly describe the mechanism of brown colour in amber glass. What is solarization ? $4 + 3 + 3 + 3 + 2$

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

   a)   Photosensitive and photochromatic glasses

   b)   Toughening of glass

   c)   Raw materials for commercial glass production

   d)   LAS glass-ceramics

   e)   Annealing of glass.

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