Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER – V (NEW) EXAMINATION – WINTER 2015

Subject Code: 2153614 **Date:10/12/2015**

Subject Name: Glass Science & Technology

Time:10:30am to 1:00pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Explain the definition of glass with examples. How glass is different from crystals - explain.	**04+03**
	(b)	Draw specific volume vs. temperature diagram showing the behavior of a melt that cools to form a) glass and b) crystal. Label each section of this diagram. Show curves for rapidly/ slowly cooling melts. Describe the schematic diagram with explanation.	**07**
Q.2	**(a)**	Describe network former, intermediate and network modifier in detail as per Stanworth explanation. Jot down the thoughts of Zachariasen for oxide glass formation.	**04+03**
	(b)	Describe the function of glass former, flux, property modifier, colorant and fining agent for a glass batch composition with examples in detail.	**07**
		OR	
	(b)	What are the various polymorphs of silica? What is Flint? Explain the formation of silica network.	**02+02+03**
Q.3	**(a)**	Define and differentiate the two processes: Nucleation and Crystal growth. Derive the series of equations for nucleation rate for homogeneous nucleation.	**02+05**
	(b)	Explain structural theory of glass formation and kinetic theory of glass formation. Explain the kinetic treatment of glass formation.	**03+04**
		OR	
Q.3	**(a)**	Define whiteware bodies. Give its applications.	**03+04**
	(b)	Describe the behavior of silicate melt and borate melt.	**07**
Q.4	**(a)**	Design the following glass batch composition with appropriate raw materials: Glass composition : $20Na_2O$-$5Al_2O_3$-$75SiO_2$; Glass composition : $20Na_2O$-$80SiO_2$;	**07**
	(b)	Explain in detail: refining of melt and homogenizing of melt.	**04+03**
		OR	
Q.4	**(a)**	What is natural magnesite? Why does it have low hydration resistance? How can the hydration resistance of magnesite be improved?	**02+02+03**

	(b)	What is Sea Water Magnesia? How is it synthesized?	**07**
Q.5	**(a)**	Explain the terms: viscosity, fluidity and viscoelasticity of glass. Give the corresponding viscosities of glass for: melting point, working point, Littleton Softening point, Glass transition temperature, annealing point, strain point.	**02+05**
	(b)	Describe the Maxwell model for relaxation of a viscoelastic material like glass.	**03+04**

OR

Q.5	**(a)**	Define glass. Explain the plot of specific volume vs. Temperature	**02+05**
	(b)	Why annealing is required in glass making? state two reasons for application of borosilicate glass in laboratories. Why homogenization is required during glass melting?	**02+02+03**

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