Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER 2012

Subject code: 714004N Date: 16-01-2013

Subject Name: Modeling and Simulation of Rubber Processing

Time: 02.30 pm – 05.00 pm 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)**	What is a Model? Classify different types and categories of models with brief description and examples.	**09**
	(b)	List out attributes of a good mathematic model of a process.	**05**
Q.2	**(a)**	Explain back propagation algorithm for ANN.	**07**
	(b)	A fluid with constant density is pumped into a cylindrical tank. The flow out of the bottom of the tank is proportional to the square root of the height of the liquid in the tank. There is a proportional controller installed to maintain level in the tank to desired set point value. Write the model describing the system and discuss use of the model for simulation of the system.	**07**
		OR	
	(b)	List out different ways by which training/learning takes place in ANN and briefly explain each. Discuss importance of training/learning.	**07**
Q.3	**(a)**	Give Step by step procedure with all stages in the development of a complete mathematic model of a process.	**07**
	(b)	The continuously stirred mixing tank with 500 liter of volumetric capacity is initially filled with salt solution. Pure water at 10 lit/min is continuously charged to it. Solution at the same rate is coming out of the tank; hence volume remains constant. Write a model stating the assumptions and using that model, calculate the time required to reach the half the original concentration in the tank. No reaction takes place in the tank.	**07**
		OR	
Q.3	**(a)**	Explain black box modeling. What are its limitations?	**06**
	(b)	Differentiate steady state and dynamic simulation listing applications of each in Rubber technology.	**08**
Q.4	**(a)**	Discuss analysis, modeling and result interpretations for simulation study of O-ring under compression using FEA.	**07**
	(b)	Discuss meshing for FEA highlighting its importance and important does and don'ts of meshing. Discuss merits and demerits of automatically generated and hands built meshes.	**07**
		OR	
Q.4	**(a)**	Discuss History of nonlinear FEA techniques/applications for Rubber.	**07**
	(b)	Discuss briefly Static FEA, Non Linearity in FEA, Dynamic analysis in FEA, Thermal analysis in FEA.	**07**

Q.5	**(a)**	Discuss modes of simulation: modular, equation oriented and global equation oriented.	**06**
	(b)	Discuss different types of Finite Elements focusing their role in FEA: One-dimensional elements, Two-dimensional elements for 2D analysis, Two-dimensional elements for 3D analysis and Three-dimensional elements.	**08**

OR

Q.5	**(a)**	Discuss ten common mistakes in FEA.	**07**
	(b)	Explain the process simulation applications for rubber product development and in manufacturing discussing key issues.	**07**

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