

GUJARAT TECHNOLOGICAL UNIVERSITY**ME Semester –I Examination Feb. - 2012****Subject code: 714001N****Date: 11/02/2012****Subject Name: The Physics of Rubber Elasticity****Time: 10.30 am – 01.00 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) Explain the importance of thermoplastic phenomena to develop relations between force, length & temperature on one hand & the thermodynamic quantities, internal energy & entropy on the other end. (14)

Q.2(A) Write about the general conditions for rubber-like elasticity. (07)

Q.2(B) Discuss in detail about Crystallization in raw rubber. (07)

OR

Q.2(B) How Crystallization occur in the stretched state? Explain in detail. (07)

Q.3 Explain the statistical form of long-chain molecule considering the model of the Polymethylene or Paraffinic type of chain. (14)

OR

Q.3(A) Explain in detail about Entropy of a single chain. (07)

Q.3(B) Discuss the statistical properties of the randomly jointed chain. (07)

Q.4 Discuss the general thermodynamic principles regarding the swelling phenomena. (14)

OR

Q.4(A) Discuss the significance of thermodynamic quantities in terms of Swelling. (07)

Q.4(B) Explain in detail about the swelling of Cross-linked polymers. (07)

Q.5(A) Explain the direct method used for the estimation of the degree of Cross-linking. (07)

Q.5(B) Discuss the relation between Cross-linking & modulus. (07)

OR

Q.5(A) Explain how Entanglements contribute to the network elasticity. (10)

Q.5(B) Explain the relation between the examined value of shear modulus G & the value predicted by the statistical theory. (04)
