

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-III EXAMINATION – SUMMER 2025

Subject Code:3132604

Date:31-05-2025

Subject Name:Rubber Physics & its thermodynamics

Time:02:30 PM TO 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.
4. Simple and non-programmable scientific calculators are allowed.

- Q.1** (a) Define the given terms: (i) Athermal Solution (ii) Quasi-Crystalline Lattice (iii) Gibb's Free Energy **03**
(b) Summarize the different molecular motions observed in rubber. **04**
(c) Explain in detail about empirical estimation of heat of polymerization. **07**
- (a) What do you mean by Q-class rubber? Also give it's example. **03**
Q.2 (b) Summarize the characteristic properties of rubber. **04**
(c) Develop Gibbs-Helmholtz equation. **07**
- OR**
- (c) Develop equation $\Delta S_{\text{mix}} = -R*(n_1 \ln N_1 + n_2 \ln N_2)$ for an ideal solution. **07**
- Q.3** (a) Why Natural Rubber (NR) shows poor weather resistance? **03**
(b) Examine Hess's law of constant heat summation with suitable example. **04**
(c) Explain in detail about the conditions necessary for rubber like elasticity in polymers. **07**
- OR**
- Q.3** (a) Why Ethylene Propylene Diene Copolymer (EPDM) shows good weather resistance? **03**
(b) Construct diagram of diagram of internal energy vs reaction co-ordination illustrating the factors affecting heat of polymerization. **04**
(c) Explain in detail about polymer dissolution. **07**
- Q.4** (a) With labeled diagram state Archimedes principle of floatation. **03**
(b) Outline the method to calculate the shape factor for rectangular and cylindrical rubber sample. **04**
(c) Explain in detail about different types of friction observed in rubber. **07**
- OR**
- Q.4** (a) Define the given terms: (i) Shear Modulus (ii) Bulk Modulus (iii) Young's Modulus **03**
(b) Brief out the method used to determine the surface tension of liquid. **04**
(c) Explain in detail about various states associated with rubber goods manufacturing. **07**
- Q.5** (a) Which type of monomers is suitable for chain growth polymerization? Also give it's examples. **03**
(b) Differentiate the low molecular weight compound and polymer. **04**
(c) Explain in detail about solution polymerization technique. **07**
- OR**
- Q.5** (a) Which type of monomers is suitable for step growth polymerization? Also give it's examples. **03**
(b) Classify the polymers on the basis of their origin, main chain backbone and application with suitable examples of each. **04**
(c) Explain in detail about suspension polymerization technique. **07**
