

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-III EXAMINATION – WINTER 2025****Subject Code:3132604****Date:15-12-2025****Subject Name: Rubber Physics & its thermodynamics****Time:10:30 AM TO 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.
4. Simple and non-programmable scientific calculators are allowed.

MARKS

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| Q.1 | (a) Explain the Degree of Polymerization with suitable example. | 03 |
| | (b) How the chain polymerization differs from step polymerization. | 04 |
| | (c) Discuss the characteristic properties of rubber. | 07 |
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| Q.2 | (a) Give the importance of density determination in rubber. | 03 |
| | (b) Write a short note on 'bulk modulus', 'shape factor' and 'elastic collision'. | 04 |
| | (c) Write a short note on diffusion in elastomer. | 07 |
| | OR | |
| | (c) Discuss in detail about Free Radical Polymerization. | 07 |
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| Q.3 | (a) Define the given terms: (i) Creep (ii) Stress Relaxation (iii) Permanent Set. | 03 |
| | (b) Explain the different types of motions observed in rubber. | 04 |
| | (c) Explain the polymer solutions in detail with respect to its thermodynamics. | 07 |
| | OR | |
| Q.3 | (a) Which types of monomers are suitable for chain growth polymerization? Also give their structures. | 03 |
| | (b) Write a short note on initiators. | 04 |
| | (c) Derive any three equations which show Maxwell's thermodynamic equations. | 07 |
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| Q.4 | (a) The potential energy of a body of mass 20 kg is 2 KJ. What is the height of the body from the ground if a body of mass 10 kg is moving at a velocity of 50 m/sec. what is the kinetic energy? | 03 |
| | (b) Define the following terms :
(I) Heat of Reaction (II) Free energy (III) Heat (IV) Entropy. | 04 |
| | (c) State the first law of Thermodynamics and derive the equation for it. | 07 |
| | OR | |
| Q.4 | (a) A man whose weight is 500 N takes 2 min. for climbing up a staircase. What is the power developed in him if the staircase is made up of 20 stairs, each 2 m in height. | 03 |
| | (b) Derive the formula for work done (W) in reversible isothermal process involving ideal gas. | 04 |
| | (c) Derive the expression of CARNOT'S THEOREM. | 07 |
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| Q.5 | (a) Give difference between state function and path function. | 03 |
| | (b) Explain the concept of Ceiling temperature. | 04 |
| | (c) Write a detailed note on Estimation of heat of polymerization. | 07 |
| | OR | |
| Q.5 | (a) Define the following terms: (I) Solvent (ii) Solution (iii) Solute. | 03 |
| | (b) Discuss about physical significance of free energy. | 04 |
| | (c) Explain in detail about Thermodynamic investigation of polymer-polymer systems for three component systems. | 07 |
