

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER • 2014

Subject code: 2714002

Date: 07-01-2015

Subject Name: Mixing of Rubbers

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) Answer the following.
- (i) Draw the Schematic Diagram of Compound behavior in Internal Mixer. (03)
- (ii) Explain the different mechanisms used for incorporating Carbon Black into Elastomer. (04)
- (b) Give the scientific explanation for Regions of Processability behaviour of compound in Mixing Mill. (07)
- Q. 2** (a) Discuss about factors which affect on Compaction process. (07)
- (b) Discuss the effect of fillers and rubber structures on tensile behavior of filled unvulcanized compound with suitable example. (07)
- OR
- (b) Explain the Viscoelastic behavior of rubber during mixing in Internal Mixer. (07)
- Q. 3** (a) Discuss Maxwell model for linear Viscoelastic response. (07)
- (b) Answer the following.
- (i) A vigot element has parameters $E = 10^8 \text{ N/m}^2$ and $\eta = 5 \times 10^{10} \text{ N}\cdot\text{s/m}^2$. Sketch the creep curve for this element if the imposed constant stress is 10^8 N/m^2 . (05)
- (ii) Explain the term Deborah number. (02)
- OR
- Q. 3** (a) Explain the viogt model for linear Viscoelastic response. (07)
- (b) Answer the following.
- (i) The constant s for a four parameter model are $E_1 = 5 \times 10^{10} \text{ N/m}^2$, $\eta_2 = 5 \times 10^{10} \text{ N}\cdot\text{s/m}^2$, $E_3 = 10^8 \text{ N/m}^2$ and $\eta_3 = 5 \times 10^8 \text{ N}\cdot\text{s/m}^2$. For creep and creep recovery experiments calculate (a) The instantaneous elastic strain (ii) The recoverable retarded elastic strain (iii) Permanent Set . (05)
- (ii) List the various techniques available to characterize the Viscoelastic behavior of gum rubber. (02)
- Q. 4** List the outline of the proposed model of a Mixing mechanism and explain in detail. (14)
- OR
- Q. 4** (a) Short Note on: Nano scale of Mixing (07)
- (b) How effective energy of Mixing can be calculated in Internal Mixer? Explain it. (07)
- Q. 5** (a) Justify the role of Liquid additives in Mixing of Rubber. (07)
- (b) Describe the causes of non-uniformity in feeding of extrusion mixing. (07)
- OR
- Q. 5** (a) The ease of Mixing be quantified and be related to the appropriate properties of filler. Justify the statement. (07)
- (b) Discuss the flow mechanism of rubber compound in Injection Molding Machine. (07)
