Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE - SEMESTER– IV(NEW) EXAMINATION – SUMMER 2015**

**Subject Code: 2142305** **Date:05/06/2015**

**Subject Name: Applied Mathematics in Plastic Industry**

**Time:10:30am-1.00pm** **Total Marks: 70**

**Instructions:**

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

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|---|---|---|---|
| **Q.1** | **(a)** | Which are the different Mathematical Models available for Viscoelastic Behavior? Explain any one in detail. | **07** |
| | **(b)** | Explain the Analysis of Continuous Fiber Composite having the Longitudinal Properties. | **07** |
| **Q.2** | **(a)** | In a condition where Spring and Dashpot are connected in series, derive different Expressions of Creep, Relaxation and Recovery. | **07** |
| | **(b)** | Explain following flow in detail (1) Drag Flow, (2) Pressure Flow and (3) Leakage Flow. | **07** |
| | | **OR** | |
| | **(b)** | The output of polythene from an extruder is $30x10^{-6}$ $m^3/s$. If the breaker plate in this extruder has 80 holes, each being 4 mm diameter and 12 mm long, estimate the pressure drop across the plate assuming the material temperature is 170°C at this point. The shear stress is 1.2x105 $N/m^2$. | **07** |
| **Q.3** | **(a)** | For Kelvin-Voigt Model Derive the different Expressions of The Creep, Relaxation and Recovery. | **07** |
| | **(b)** | Provide the detail of Isothermal Flow of Newtonian Fluid, which is Flowing in between the Parallel Plates. | **07** |
| | | **OR** | |
| **Q.3** | **(a)** | Enlist the Experimental Methods used to obtain the Flow Data Of Polymer Material and explain any one in detail. | **07** |
| | **(b)** | How do you provide the Expressions of the Pressure Flow and Leakage Flow for the Flow Analysis in the Extruder? | **07** |
| **Q.4** | **(a)** | What is Radius of Gyration? Explain Radius of Gyration of Linear Ideal Chain. | **07** |
| | **(b)** | A polypropylene beam is 100 mm long, simply supported at each end and is subjected to a load W at its mid-span. If the maximum permissible strain in the material is to be 1.5%, calculate the largest load, which may be applied so that the deflection of the beam does not exceed *5* mm in a service life of 1 year. For the beam $I$ = 28 mm4 and Modulus is 347 $MN/m^2$ | **07** |
| | | **OR** | |
| **Q.4** | **(a)** | What is Ram Extruder? Explain it in detail. | **07** |
| | **(b)** | The density of a composite made from unidirectional glass fibres in an epoxy matrix is 1950 $kg/m^3$. If the densities of the glass and epoxy are known to be 2540 $kg/m^3$ and 1300 $kg/m^3$, calculate the weight fraction of fibers in the composite. | **07** |
| **Q.5** | **(a)** | Define Concentric Cylinder Viscometer. In addition, Explain how we use it to Obtain the Flow Data of Polymer. | **07** |
| | **(b)** | Explain Creep Curve in detail. | **07** |
| | | **OR** | |
| **Q.5** | **(a)** | Explain Following in detail, (1)Temperature Gradient and (2) Fourier Number | **07** |
| | **(b)** | Explain the Kramers Theorem in detail. | **07** |

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