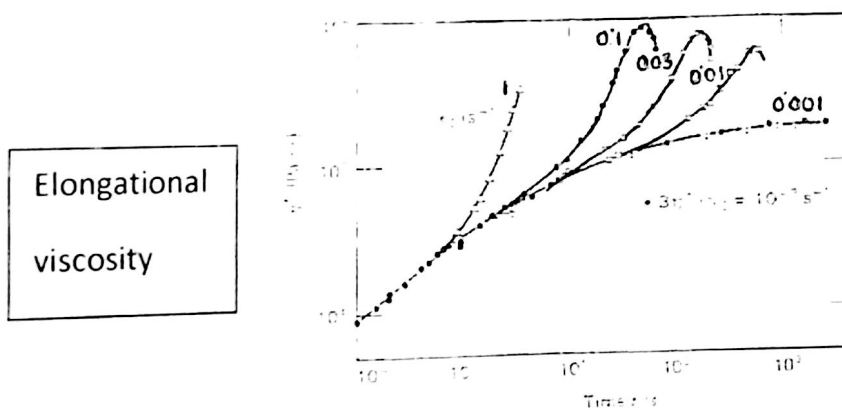1. Derive Hagen-Poiseuille's law   5
2. (a) Why most polymer melt/solution show shear-thinning behavior?   2
   (b) Which signatures of polymeric fluids separate them from Newtonian behavior?   3
3. The figure provided below depicts elongational viscosity as a function of time for low density polyethylene melt.

What conclusion you can make from this plot about (a) nature of the polymer, (b) nature of the elongational flow.   5

4. (a) What are the necessary requirements for spinnability?   3

   (b) On which factors die swell depends?   2