

FEDERAL UNIVERSITY OF TECHNOLOGY, OWERRI
SCHOOL OF ENGINEERING AND ENGINEERING TECHNOLOGY
DEPARTMENT OF POLYMER AND TEXTILE ENGINEERING

2019/2020 HARMATTAN SEMESTER EXAMINATIONS

PTE 401 (POLYMER PROCESSING ENGINEERING TECHNOLOGY II) (3 Units)

Instruction: Answer any five (5) questions. Date: 11/02/21. Time: 2½ Hours

1. a) Cellular polymer products have increasing applications in many fields. Identify four (4) inherent features of the polymers used for cellular materials.
 b) What are the general technique of producing cellular structure?
 c) Name the two forms of foams in terms of structure. (12 Marks)

2. a) Describe a practical means of producing synthetic foam
 b) Use equations to illustrate the production of Polyurethane foams. What are the properties of this foam?
 c) Give two reasons each of modifiers and surfactants used in foam production? What is parts by weight? (12Marks)

3. a) Describe the process of selecting function to fit empirical data.
 b) The dimension of a mould for a standard foam production is given as $12 \times 4.6 \times 2$ feet. Assuming the time of rise in relation to introduction of blowing agent is 20 minutes. Propose a model that will always produce the standard foam. (12 Marks)

4. a) Describe briefly Welding of Plastics
 b) Use only Diagram to illustrate the welding of "Butt joint" of plastics
 c) Write down the following:
 (i) types of plastic rods in welding (ii) the factors that determine the shape of the welding rods for plastics (iii) the common joints found in plastic welding. (12 Marks)

5. a) What is Pressure Flow?
 b) Use an illustrative diagram only to represent a "Plane Couette Flow" between two parallel plates, whereby the upper plate is moving at a constant Velocity, μ .
 c) Give the Hagen-Poiseuille equation that shows the relationship between the Volumetric flow rate Q, the radius R, the pressure P, the length L and viscosity μ of a fluid flowing through the capillary. (12 Marks).

- 6) Given the following data for a Polyisobutylene sample in cyclohexane solvent at a temperature of 30 °C

Concentration (C)	0.05	0.10	0.15	0.20
Relative Viscosity (η_r)	1.282	1.611	1.988	2.412

- a) Produce the plot of Reduced viscosity(η_{sp}/C) versus Concentration according to Huggin's equation.
- b) Write down Huggin's equation for specific viscosity (η_{sp}) and Intrinsic viscosity ($[\eta]$) relationship.
- c) From your plot in (6a) above, determine the Intrinsic viscosity at Infinite dilution and the Huggin's constant K. (12 Marks).