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RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. (General) Degree in Applied Sciences
Third Year - Semester I Examination – September/ October 2019

CHE 3203 – CHEMISTRY OF POLYMERS

Time: Two (02) hours

Answer all questions.
Use of a non-programmable calculator is permitted.
Molar masses in $gmol^{-1}$: H = 1, C = 12, O = 16

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1. a) Compare the properties of thermoplastics with the thermosetting plastics. (20 marks)

   b) What are the factors that determine the glass transition temperature of a polymer? (15 marks)

   c) How would you distinguish elastomers, thermoplastics and engineering thermoplastics based on glass transition temperature? (15 marks)

   d) Briefly explain how the melting temperature of a polymer influences by the chemical structure. (20 marks)

   e) Give the chemical reactions for the preparation of two types phenol-formaldehyde resins. Indicate the reaction conditions appropriately. (30 marks)

2. a) Write the suitable chemical reactions for Initiation, Propagation and Termination of free radical vinyl polymerization in the presence of peroxides. (40 marks)

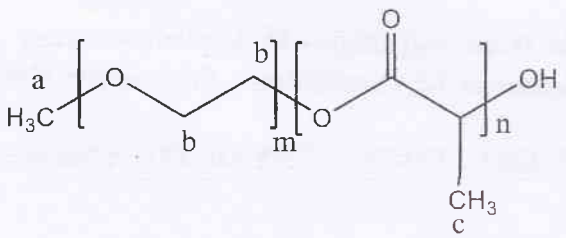
   b) Explain the advantages of cross link polymers over linear polymers. (20 marks)

   c) Compare the properties of crystalline polymers and amorphous polymers. (40 marks)

Cont.

3. a) Explain how you determine the rate constant of the step growth polymerization for self-catalyzed systems. (Derivation of equations required) (50 marks)

b) The structure of a polymer X is given below.



Ratio of area under the curves of the peaks which are relevant to protons a, b and c are 1: 20: 16 respectively. Calculate the number average molecular weight (M_n in Dalton) of the above polymer.

(50 marks)

4. a) Draw the structure of the repeating unit of natural rubber. (10 marks)

b) Natural rubber can be described as a suspension. Briefly explain its composition.

(30 marks)

c) Briefly explain the rubber harvesting steps. Include the chemistry appropriately.

(30 marks)

d) Write down the chemical reactions for the vulcanization of natural rubber.

(30 marks)

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