Uva Wellassa University, Sri Lanka
End Semester Examination – March 2012
SCT 443-2 Polymer Technology

Duration: Two (02) hours

Uva Wellassa University

Total five (05) questions
Answer four (04) questions only

1. a. Give a brief description of locally available natural rubber grades for the rubber product manufacturing industry in Sri Lanka.
(Detailed manufacturing processes are not necessary)

(20 marks)

b. i. "Accelerated sulphur vulcanization" is a very important step involved in value addition process to dried raw natural rubber. Give a brief account on the necessity and importance of it.

(30 marks)

ii. Explain briefly another way of value addition to the natural raw rubber either in dry or liquid form.

(20 marks)

c. With reference to the chemical structures, compare briefly the performance properties of the following rubbers.
i. EPDM rubber and SBR
ii. Reclaim rubber and natural rubber

(30 marks)

2. a. i. "Oxidative degradation of polymers is in autocatalytic reaction". Comment on this statement.
ii. List the three main types of preventive ant-oxidants and give a typical chemical structure for each type.

(40 marks)

b. i. List out the main quality parameters of fillers.
ii. Write down two possible advantages of the use of fillers in product manufacturing industry based on dry rubber.

(30 marks)

c. i. What are the major functions involved in preparation of a rubber compound for a particular application.
ii. Suggest a simple test that could be carried out at the factory level for determination of the efficiency of preparation of a dry rubber compound using a given recipe.

(30 marks)

3. a. Define the term "latex" as applied to natural rubber industry.

(10 marks)

b. List out major physical resources except product testing facility required at latex based rubber product manufacturing industry.

(30 marks)

c. Classify the chemical ingredients commonly incorporated into natural rubber and explain the reasons for their requirements.

(20 marks)

d. A formulation proposed for examination gloves is given below.

	Parts by weight (wet parts)
60% NR latex	167.0
10% KOH solution	5.0
20% Potassium laurate solution	2.0
20% Silica dispersion	15.0
50% Sulphur dispersion	2.0
50% Zinc Diethyl dithiocarbomate dispersion	2.6
50% Phenolic Antioxidant dispersion	4.0
50% Zinc Oxide dispersion	2.4

i. Calculate the ZDEC:Zno ratio (by dry weight) in the above compound.

ii. Calculate the daily requirement of centrifuged latex in m^3 to produce ten millions of items.
(Hint: an average weight of dry rubber at item: 50 g, Density of Centrifuged latex = 960 kg/m^3)

iii. What is the function of Potassium laurate solution in this rubber compound?

(40 marks)

4. a. What are the advantages and disadvantages of thermosets over thermoplastics in rubber product manufacturing industry?

(15 marks)

b. List out four common quality parameters of commodity plastics and briefly explain one test method for one of the above mentioned quality parameters.

(30 marks)

c. Write short notes on the following topic.

i. Amorphous thermoplastics

ii. Semi-crystalline thermoplastics

(25 marks)

d. Compare and contrast the followings.

i. Compression molding and Transfer molding

ii. Shear thinning and shear thickening of polymer melts

(30 marks)

5. a. List out four common shaping processes for plastics except the extrusion process.

(20 marks)

b. With an aid of a suitable labeled diagram, explain the shaping process of a single Screw extruder.

(50 marks)

c. Explain briefly what is meant by the following in relation to processing of plastic materials.

i. Die swell

ii. "Psedudoplastic material"

iii. Tm

(30 marks)

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