Uva Wellassa University, Sri Lanka
End Semester Examination – March 2011
SCT 443-2 Polymer Technology

Time: Two (02) hours

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

1) a. Write a brief account on the value addition to the natural rubber field latex available in Sri Lanka.

(20 marks)

b. i. A Sri Lankan rubber band manufacturing factory uses UFUB (Un-fractionated and un bleached) crepe rubber as its main raw material. Suggest an alternative type of locally available natural rubber grade with a brief justification.

ii. List out anticipated problems that may arise with possible remedial measures when the proposed alternative type is used in the rubber band production.

(30 marks)

c. i. What are the major factors involved in ageing of natural rubber?

ii. Briefly explain the most appropriate control system for each of the above influencing factors.

(50 marks)

2) a. Mastication is an important step in the conversion process of raw rubber into value added products.

i. Define the term "mastication" as applied to rubber industry and give a brief account on the effect of temperature and peptizers on the mastication efficiency of an elastomer.

ii. Give a process flow chart to show the above conversion process of raw rubber to a value added product.

(50 marks)

b. Sketch a typical rheograph for a rubber compound and indicate the following compound processability characteristics on the same graph?

i. Scorch time
ii. Maximum cure
iii. T_{90}

(30 marks)

c. State the possible causes of scorchiness during the mixing process of a rubber compound.

(20 marks)

3) a. Explain the major reaction steps involved in the reaction series of crosslinking formation during the sulphur vulcanization of an elastomer.

(20 marks)

b. A Natural rubber based formulation is given below for a General purpose conveyor belt covers.

Natural rubber	100.0
ZnO	6.0
Stearic Acid	2.0
CBS	2.5
DPG	0.5
N 330 HAF black	80.0
Processing oil	27.0
IPPD	2.0

i. List out common factors that should be considered in the compound designing.

ii. List out three technically important characteristics to be considered in the selection process of processing aids in the above rubber compound.

iii. If one meter length of this conveyor belt weights about 2 kg, calculate the dry rubber content in a unit area of the conveyer belt.

iv. If the factory produces one thousand meter (1000 m) per day, calculate the daily requirement of filler and procession oil for this factory.

(60 marks)

c. If you are a factory manager of the above factory, propose three quality control tests that you would introduce for the rubber compound.

(20 marks)

4) a. State five important characteristics of fillers used in NR industry.

(25 marks)

b. List out four technical factors need to be considered in selecting of a plastizer for a rubber compound.

(20 marks)

c. Briefly discuss four tyre retarding processes.

(25 marks)

d. Give a flow diagram for manufacture of rubber bands stating from raw materials and explain the quality checking and assurance procedures that could be adopted in the industry.

(30 marks)

5) a. Define the following terms commonly used in the rubber latex industry.

i. Surfactants

ii. Ball milling

(20 marks)

b. Briefly discuss the steps involved in the manufacture of examination gloves using coagulant dipping method.

(20 marks)

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

	Parts by weight
60% NR latex	167.0
10% KOH solution	4.0
20% Potassium laurate solution	1.5
50% Sulphur dispersion	2.0
50% Zinc diethyl dithuocarbomate dispersion	1.5
50% Zinc dibutyl dithuocarbomate dispersion	0.5
50% Phenolic Antioxident dispersion	2.5
50% Zinc Oxide disperson	1.5

i. If a rubber glove has an average weight of 12g, calculate the 60% NR latex requirement to produce 10 million glove order.

ii. Explain briefly how can you prepare 50% sulphur dispersion.

iii. Calculate the maximum possible Zn ion concentration in ppm and give the assumptions made, if any.

(60 marks)

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