Uva Wellassa University
Faculty of Animal Science & Export Agriculture
BSc in Palm & Latex Technology and Value Addition

End Semester Examination January/February 2016

Year II Semester II

Palm and Latex Industrial Machinery (PLT 234-2)

Instructions

Answer for all questions.

No. of questions	:	Two (02)
No. of pages	:	Three (03)
Time	:	One (01) Hour
Total marks allocated	:	50%

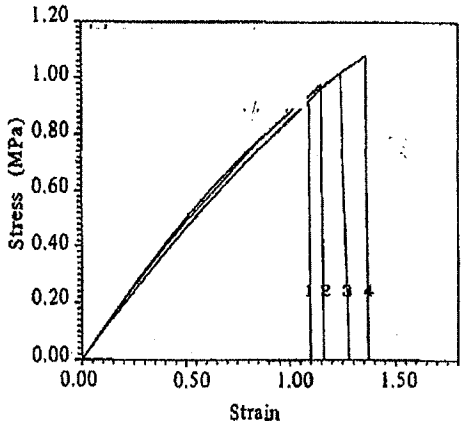
Index No:

PART 2 - ESSAY QUESTIONS

Question 1

An experiment was conducted to examine the viscoelastic behavior of glass beads-filled silicone rubber composites (GFSC).

1.1 Different strain rates such as 0.01, 0.02, 0.06 and 0.1 (1/sec) are given to the GFSC specimen to study the Stress-Strain relationship. The graph plotted for Stress-Strain relationship is given below.



a) State the suitable graph for the above mention each strain rate.

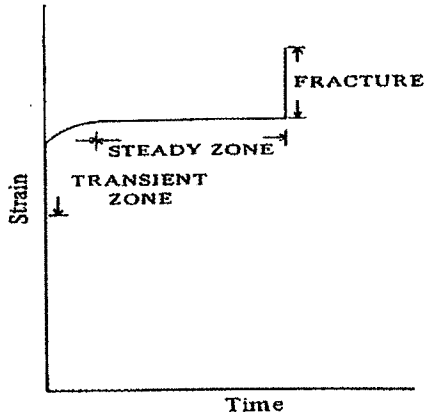
b) Explain your answer.

c) If it an untreated natural rubber, draw the expected Stress-strain relationship on the given graph.

(10 x 3 marks)

50

1.2 The creep loading machine is used to determine the creep strain-time relation under constant loading. The coefficient of the creep compliance relation C (t) = ε (t) / σ is shown in the figure below.



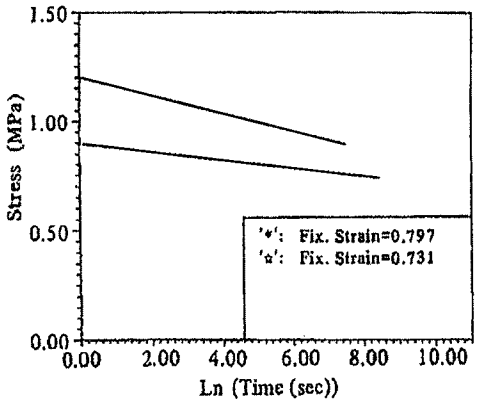
a) Explain the pattern of the graph shown in the figure with the microscopic view.

b) Draw the typical strain curve for the rubber on the given graph and mark the type of creep.

c) Draw the Strain-Time graph to show creep behavior of elastic, viscos and viscoelastic

(10 x 3 marks)

1.3 Stress relaxation test is conducted by fixing the specimen under constant strain condition and measuring the stress decay with time. The graph plotted for Stress-Ln (Time) relationship for two different strains (0. 797 and 0.731) is given below.



a) Find out the suitable graph for both strain and mark them as 0.797 and 0.731 on the given graph. (10 marks)

b) Find out the Stress Relaxation Modulus (ER) for both graphs. (20 marks)

c) Find out the rate of stress relaxation for both (10 marks)

Question 2

Three natural rubber (NR) compounds were prepared using a laboratory scale internal mixer according to the formulation given in the below table

Compounding ingredients	NR-gum compound (phr)	NR-B (phr)	NR-C (phr)
Natural rubber	100	100	100
Carbon black	-	50-	-
$CaCO_3$	-		50
Zinc oxide	05	05	05
Stearic acid	02	02	02
Sulphur	2.2	2.2	2.2
Vul. accelerator	1.2	1.2	1.2

2.1 Briefly explain how you could effectively use the laboratory scale internal mixer to achieve uniform dispersion and distribution of carbon black in the NR-B compound.

2.2 Draw the tensile stress-strain curve for NR-gum vulcanizate and mark all tensile properties on the graph.

2.3 Draw possible tensile stress-strain curves of NR-B and NR-C and compare with NR-gum vulcanizate. (Note. Draw all stress-strain curves in a single graph).

2.4 Briefly discuss the heat build-up behavior of NR-B and NR-C.

(25 x 4 marks)