AF2903 **Spring 2014**

Highway Construction and Maintenance

Group __________

Exercise 1, Question 1:

Due by April 7th, 2014

Each group will perform following tests in the laboratory:

1. Softening point R&B according to EN 1427
2. Penetration at 25°C according to EN 1426

Heukelom diagram (1973).

a) Use your test results and plot it in the Bitumen Test Data Chart (BTDC). Predict viscosity at 60°C, breaking point Fraass and Penetration index (PI). Then fill in the table with your results.

b) Calculate Penetration Index using equation developed by **Pfeiffer and Van Doormal (1936)** and fill in the table provided**:**

$$\mathrm{PI} = \frac{1952 - 500\log PEN - 20\mathrm{SP}}{50\log PEN - \mathrm{SP} - 120}$$

Where,
SP = Softening Point
PEN = Penetration at 25°C

Table.1 Test Results and Analysis

BINDER

	FROM LAB TESTS		**FROM BTDC (Heukelom Diagram)**			**FROM EQUATION**
GROUP	Penetration dmm	Softening Point °C	Viscosity at 60°C Poises	Fraass Breaking Pt °C	Penetration Index PI	Penetration Index PI

Submit to: **Ali Azhar Butt**

ali.butt@abe.kth.se

Exercise 1, Question 2:

Determine the mixing and compacting temperature of the asphalt based on the binder viscosity results.

		Viscosity @ Temp	Viscosity @ Temp	Mixing temperature range	Compacting temperature range
Group 1	Binder A	0,85 @ 140°C	0,33 @ 155°C		
Group 2	Binder B	0,70 @ 135°C	0,11 @ 170°C		
Group 3	Binder C	0,64 @ 150°C	0,15 @ 175°C		

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Exercise 1, Question 3:

Permanent Deformation Approach

a) You are given two materials. Draw a vector diagram, and use the equations given in the lecture to determine the Complex modulus and phase angle. Which material is more elastic?

Material A	Material B
The elastic component of the complex modulus is 3, the viscous component of the complex modulus is 4.	The elastic component of the complex modulus is 4, the viscous component of the complex modulus is 3.

Fatigue Approach

b) You are given two materials. Draw a vector diagram, and use the equations given in the lecture to determine the Complex modulus. Which material is more elastic?

Material X	Material Y
The elastic component of the Complex modulus is 2, the viscous component of the Complex modulus is 2, the phase angle is 45°.	The elastic component of the Complex modulus is 1.7, the viscous component of the Complex modulus is 1.2, the phase angle is 35°.

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