

Highway Construction and Maintenance

Group _____

Exercise 1, Question 1:

Due by April 21st, 2013

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:

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

Where,

SP = Softening Point

PEN = Penetration at 25°C

Table.1 Test Results and Analysis

BINDER

GROUP	FROM LAB TESTS		FROM BTDC (Heukelom Diagram)			FROM EQUATION
	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**

Highway Construction and Maintenance**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 <u>elastic component</u> of the complex modulus is 3, the <u>viscous component</u> of the complex modulus is 4.	The <u>elastic component</u> of the complex modulus is 4, the <u>viscous component</u> 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 <u>elastic component</u> of the Complex modulus is 2, the <u>viscous component</u> of the Complex modulus is 2, the <u>phase angle</u> is 45° .	The <u>elastic component</u> of the Complex modulus is 1.7, the <u>viscous component</u> of the Complex modulus is 1.2, the <u>phase angle</u> is 35° .