

Unit 2 - Introduction to viscoelasticity

Course outline

How does an NPTEL online course work?

Introduction to viscoelasticity

- Introduction
- Deborah number
- Response of Elastic solid
- Response of Viscous fluid
- Viscoelastic material

Quiz : Week 1 Assessment

Viscoelasticity and Introduction to polymers

Viscoelasticity and Introduction to polymers

Constitutive Equations

Viscoelastic models

Viscoelastic models

Viscoelastic models (cont.) & Constitutive modelling

Response to Sinusoidal oscillations

Weekly Feedback forms

Text Transcripts

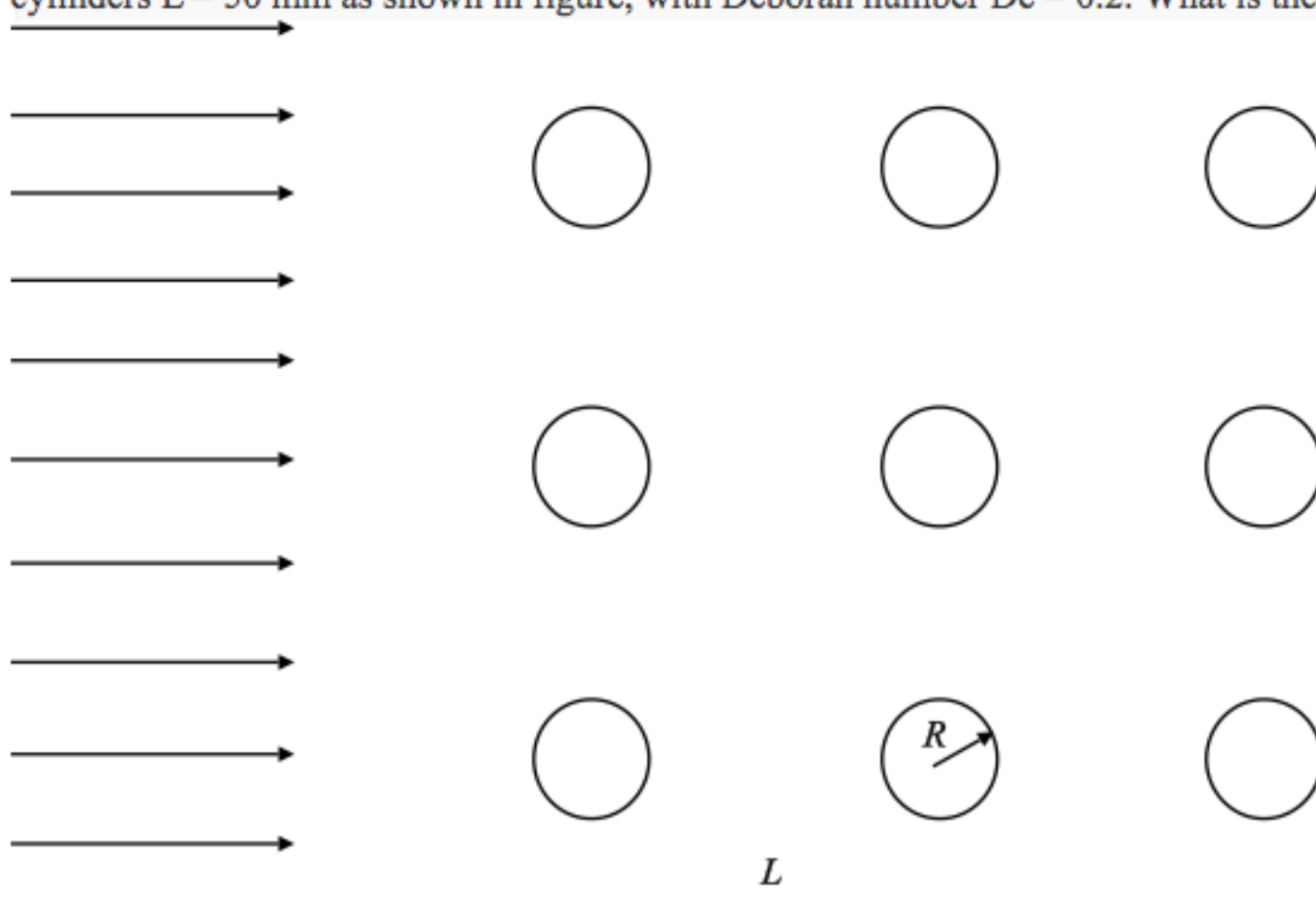
Week 1 Assessment

The due date for submitting this assignment has passed. As per our records you have not submitted this assignment.

Due on 2020-03-04, 23:59 IST.

Week 1 Assessment

1) A uniform flow with velocity $U_\infty = 5$ m/s is passed through an array of cylinders with radius, $R = 10$ mm, the spacing between the **1 point** cylinders $L = 50$ mm as shown in figure, with Deborah number $De = 0.2$. What is the time of relaxation of the fluid?



- 6 ms
- 4.2 ms
- 1.2 ms
- 0.5 ms

No, the answer is incorrect. Score: 0

Accepted Answers: 1.2 ms

2) A solid specimen having modulus of elasticity $E = 90$ GPa and length $L = 200$ mm is subjected to stress control test with an input **1 point** of $\sigma = 0.5t^2 + 9t + 4$ MPa. How much is the elongation of the specimen after 1s?

- 0.03 mm
- 0.06 mm
- 1 mm
- 0.1 mm

No, the answer is incorrect. Score: 0

Accepted Answers: 0.03 mm

3) In Problem 2, if the entire stress on the solid specimen is released at time $t = 5$ s. What is the strain (ϵ) in the material **1 point** at time $t = 7$ s? (Hint: Assume ideal solid)

- 0.1
- 0
- 0.5
-
- ∞

No, the answer is incorrect. Score: 0

Accepted Answers: 0

4) What is the range of Deborah number (De) and Weissenberg number (Wi) for viscometric flows? **1 point**

- $De \rightarrow 0, Wi = 0$ to ∞
- $De = 0$ to $\infty, Wi \rightarrow \infty$
- $De \rightarrow \infty, Wi = 0$ to ∞
- $De \rightarrow \infty, Wi \rightarrow \infty$

No, the answer is incorrect. Score: 0

Accepted Answers: $De \rightarrow 0, Wi = 0$ to ∞

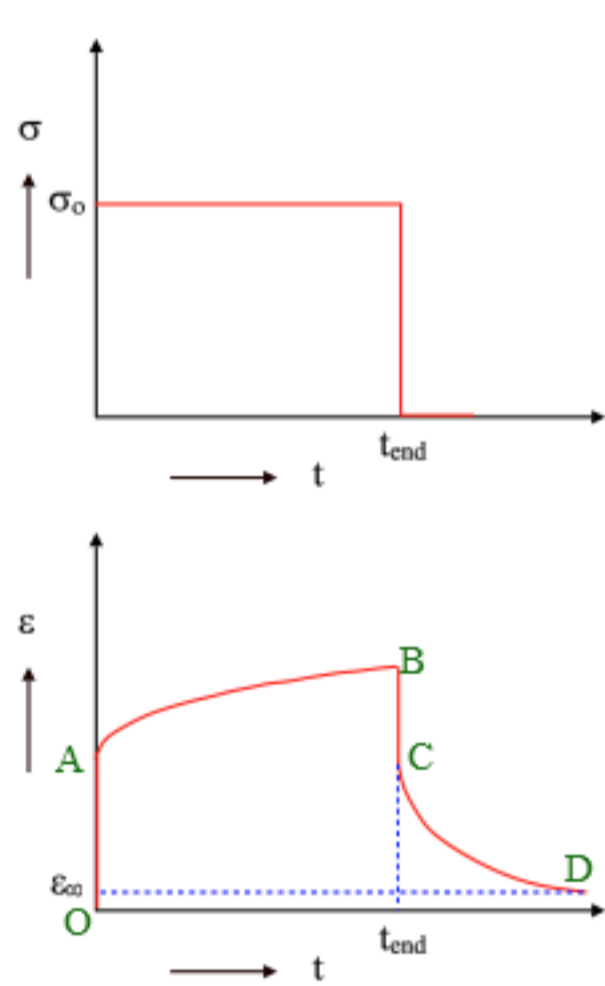
5) If a viscoelastic material is subjected to sinusoidal oscillations, range of phase difference between stress and strain is _____? **1 point**

- $(-\frac{\pi}{2}, \frac{\pi}{2})$
- $(0, \frac{\pi}{2})$
- $(-\frac{\pi}{2}, 0)$
- $(0, \pi)$

No, the answer is incorrect. Score: 0

Accepted Answers: $(0, \frac{\pi}{2})$

6) A viscoelastic material is subjected to stress control test and stress release test and the response of strain is as shown in figure. If **1 point** the material is viscoelastic solid, the strain as time $t \rightarrow \infty$ is _____?



- 0
-
- ∞
- ϵ (Finite value)
- 0.1

No, the answer is incorrect. Score: 0

Accepted Answers: 0

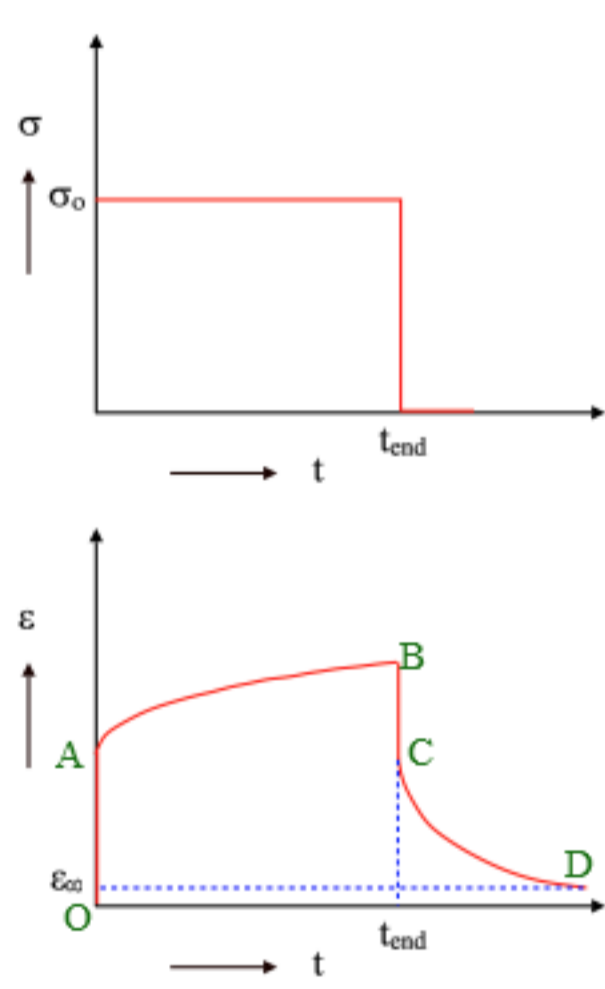
7) If a fluid with viscosity $\mu = 0.1$ Pa.s is subjected to input $\sigma = 0.5t^2$ Pa for 5s, identify the strain on the fluid when the stress applies **1 point** is stopped.

- 208
- 1000
- 215
- 0

No, the answer is incorrect. Score: 0

Accepted Answers: 208

8) A viscoelastic material is subjected to stress control test and stress release test and the response of strain is as shown in figure. If **1 point** the material is viscoelastic fluid, the strain as time $t \rightarrow \infty$ is _____?

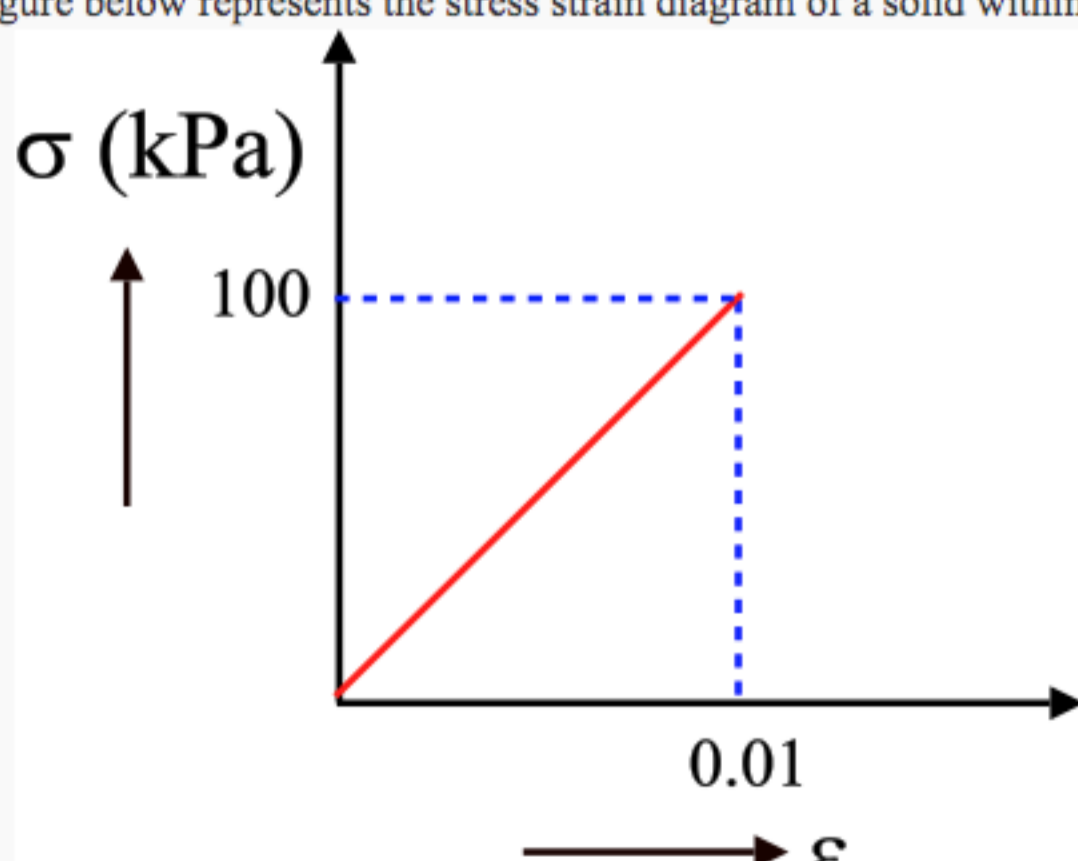


- 0
-
- ∞
- ϵ (Finite value)
- 0.1

No, the answer is incorrect. Score: 0

Accepted Answers: ϵ (Finite value)

9) Figure below represents the stress strain diagram of a solid within the elastic limit. What is the resilience in the material? **1 point**



- 0.25 kJ
- 0.5 kJ
- 0.1 kJ
- 0 kJ

No, the answer is incorrect. Score: 0

Accepted Answers: 0.5 kJ

10) What is the modulus of elasticity for the material with a stress strain curve given in problem 9? **1 point**

- 5 MPa
- 12 MPa
- 15 MPa
- 10 MPa

No, the answer is incorrect. Score: 0

Accepted Answers: 10 MPa