Unit 7 - Viscoelastic models

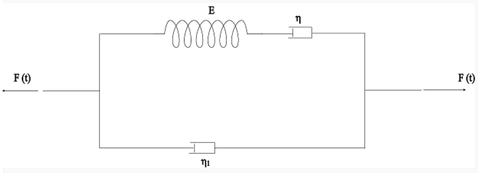
Week 6 Assessment

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

Due on 2020-04-08, 23:59 IST.

1) **Common data for Questions 1 to 6** *1 point*

Consider a three-element model as shown in figure below.



To which of the following materials the above three element model is most appropriate.

- Viscoelastic Fluid
- Fluid
- Solid
- Viscoelastic Solid

No, the answer is incorrect.
Score: 0
Accepted Answers:
Viscoelastic Fluid

2) What is the constitute equation for this model? (Here P_0, P_1&P_2 corresponds to coefficients of stress of order matching the subscript and Q_0, Q_1&Q_2 corresponds to coefficients of strain of order matching the subscript) *1 point*

- $P_0\sigma + P_1\dot{\sigma} = Q_1\dot{\epsilon} + Q_2\ddot{\epsilon}$
- $P_1\dot{\sigma} + P_2\ddot{\sigma} = Q_1\dot{\epsilon} + Q_2\ddot{\epsilon}$
- $P_0\sigma + P_2\ddot{\sigma} = Q_0\epsilon + Q_1\dot{\epsilon}$
- $P_0\sigma + P_1\dot{\sigma} = Q_0\epsilon + Q_1\dot{\epsilon}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$P_0\sigma + P_1\dot{\sigma} = Q_1\dot{\epsilon} + Q_2\ddot{\epsilon}$

3) Identify the correct expressions for P_0&P_1 in the constitute equation. (**Hint**: Apply by an appropriate factor if necessary). *1 point*

- $\frac{1}{E}, \frac{1}{\eta_1}$
- $\frac{1}{\eta\eta_1}, \frac{1}{E\eta_1}$
- $\frac{\eta+\eta_1}{\eta\eta_1}, \frac{1}{E}$
- $\frac{\eta+\eta_1}{\eta}, \frac{\eta}{E}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{1}{\eta\eta_1}, \frac{1}{E\eta_1}$

4) Identify the correct expressions for Q_1&Q_2 in the constitute equation. (**Hint**: Apply by an appropriate factor if necessary). *1 point*

- $\frac{1}{E}, \frac{1}{\eta_1}$
- $\frac{1}{E\eta}, \frac{1}{\eta\eta_1}$
- $\frac{\eta+\eta_1}{\eta\eta_1}, \frac{1}{E}$
- $\frac{\eta+\eta_1}{\eta}, \frac{\eta}{E}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{\eta+\eta_1}{\eta\eta_1}, \frac{1}{E}$

5) If $\eta_1 = 0$, then the model is equivalent to which of the following? *1 point*

- Kevin-Voigt
- Maxwell
- Jeffrey's
- N- Maxwell

No, the answer is incorrect.
Score: 0
Accepted Answers:
Maxwell

6) If $\eta = 0$, then the model is equivalent to which of the following? *1 point*

- Kevin-Voigt
- Maxwell
- Jeffrey's
- N- Maxwell

No, the answer is incorrect.
Score: 0
Accepted Answers:
Kevin-Voigt

7) **Common data for Questions 7 to 10** *1 point*

Consider a Kevin-Voigt model and a spring placed in series. The constitutive equation is of the form.

- $P_0\sigma + P_1\dot{\sigma} = Q_1\dot{\epsilon} + Q_2\ddot{\epsilon}$
- $P_1\dot{\sigma} + P_2\ddot{\sigma} = Q_1\dot{\epsilon} + Q_2\ddot{\epsilon}$
- $P_0\sigma + P_2\ddot{\sigma} = Q_0\epsilon + Q_1\dot{\epsilon}$
- $P_0\sigma + P_1\dot{\sigma} = Q_0\epsilon + Q_1\dot{\epsilon}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$P_0\sigma + P_1\dot{\sigma} = Q_0\epsilon + Q_1\dot{\epsilon}$

8) How are the constants P_0, P_1, Q_0&Q_1 related for the above model? *1 point*

- $\frac{Q_1}{P_1} > \frac{Q_0}{P_0}$
- $\frac{Q_0}{P_1} > \frac{Q_1}{P_0}$
- $\frac{Q_1}{P_1} > \frac{Q_0}{P_0}$
- $\frac{Q_0}{P_0} > \frac{Q_1}{P_1}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{Q_1}{P_1} > \frac{Q_0}{P_0}$

9) Using a physical argument based on the response of the spring and viscous damper in the mechanical analog to a step change in force, what is the initial condition for the system? *1 point*

- $P_1\sigma(0^+) = Q_0\epsilon(0^+)$
- $P_0\sigma(0^+) = Q_0\epsilon(0^+)$
- $P_1\sigma(0^+) = Q_1\epsilon(0^+)$
- $P_0\sigma(0^+) = Q_1\epsilon(0^+)$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$P_1\sigma(0^+) = Q_1\epsilon(0^+)$

10) What is the response of stress due to arbitrary strain history? (Here, $G(t)$ is stress relaxation function) *1 point*

- $\int_{-\infty}^{t} G(t)\dot{\epsilon}(s)ds$
- $\int_{-\infty}^{0} G(t-s)\dot{\epsilon}(s)ds$
- $\int_{-\infty}^{t} G(t-s)\dot{\epsilon}(s)ds$
- $\int_{-\infty}^{t} G(t)\epsilon(s)ds$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\int_{-\infty}^{t} G(t-s)\dot{\epsilon}(s)ds$