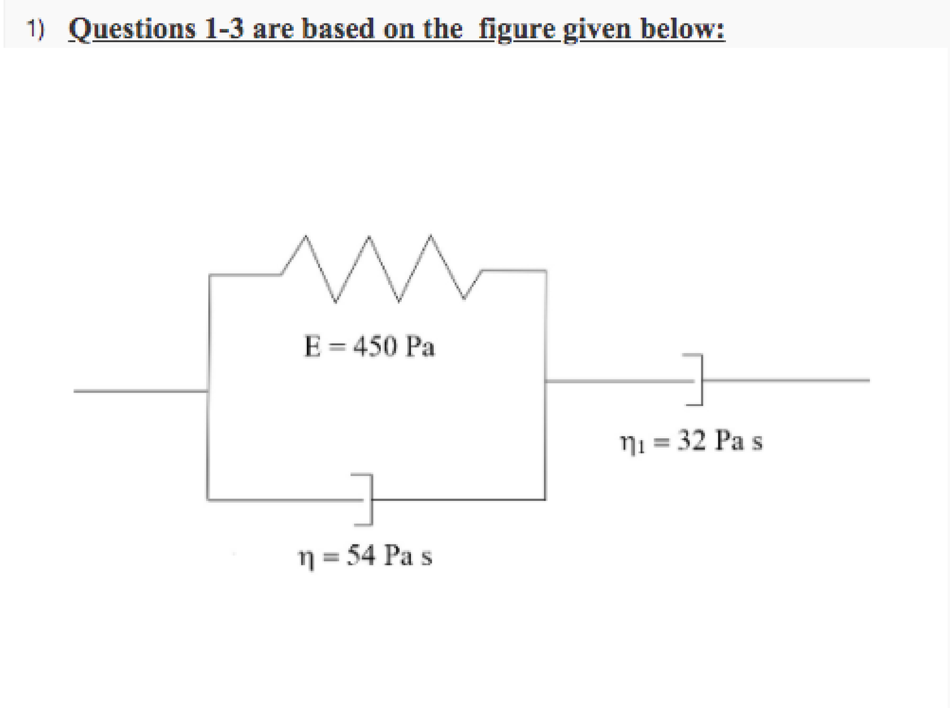
Unit 8 - Viscoelastic models (cont.) & Constitutive modelling

Week 7 Assessment

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

Due on 2020-04-15, 23:59 IST.

1) **Questions 1-3 are based on the figure given below:** *1 point*



Identify correctly the Viscoelastic model that the figure represents:

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

No, the answer is incorrect.
Score: 0
Accepted Answers:
Jeffrey's

2) If the constitutive equation is of the form $P_0\sigma + P_1\dot{\sigma} = Q_1\dot{\epsilon} + Q_2\ddot{\epsilon}$ and $P_0 = 450Pa$, then identify the values of P_1, Q_1 & Q_2. *1 point*

- $P_1 = 14400, Q_1 = 86, Q_2 = 1728$
- $P_1 = 1728, Q_1 = 14400, Q_2 = 86$
- $P_1 = 86, Q_1 = 24300, Q_2 = 1728$
- $P_1 = 86, Q_1 = 14400, Q_2 = 1728$

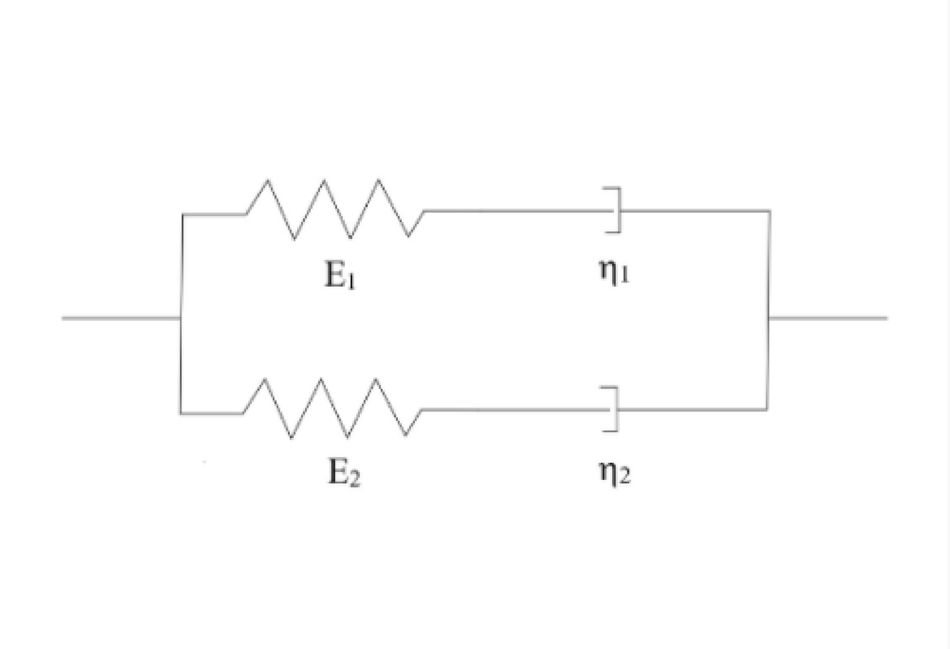
No, the answer is incorrect.
Score: 0
Accepted Answers:
$P_1 = 86, Q_1 = 14400, Q_2 = 1728$

3) Value of the two time scales associated with this model are ___ & ___. *1 point*

- 0.12s, 0.191s
- 0.071s, 0.191s
- 0.12s, 0.382s
- 0.071s, 0.382s

No, the answer is incorrect.
Score: 0
Accepted Answers:
0.071s, 0.191s

4) A two Maxwell fluid system as shown in figure below: *1 point*



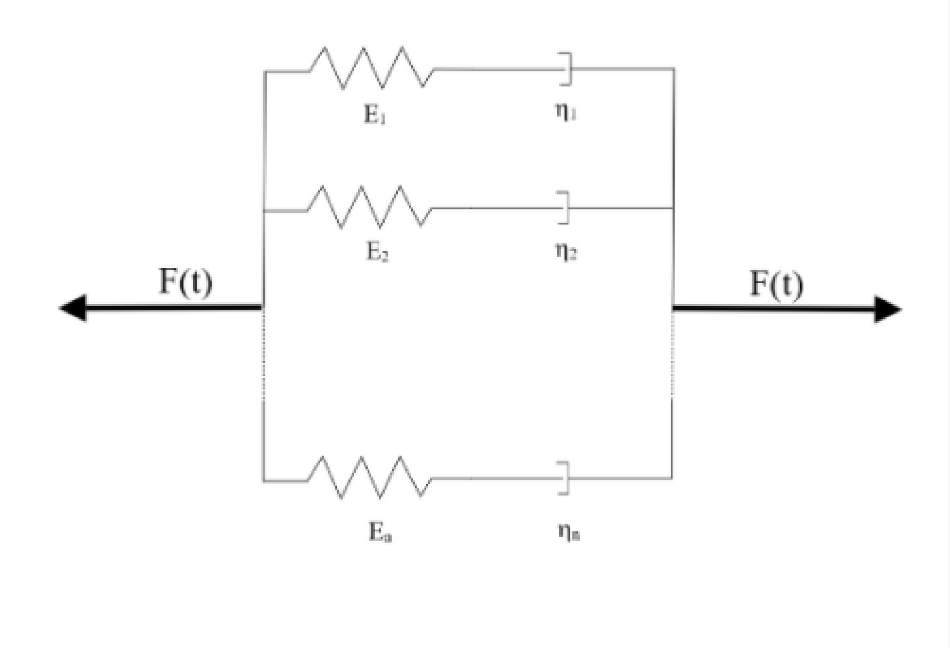
The constitutive equation of this model is of the form: $P_0\sigma + P_1\dot{\sigma} + P_2\ddot{\sigma} = Q_1\dot{\epsilon} + Q_2\ddot{\epsilon}$ where $P_0 = E_1E_2$. Then the find the values of coefficients $P_1 \& Q_2$

- $\eta_1\eta_2, (E_1 + E_2)\eta_1\eta_2$
- $\eta_1E_2 + \eta_2E_1, (E_1 + E_2)\eta_1\eta_2$
- $\eta_1E_2 + \eta_2E_1, E_1E_2(\eta_1 + \eta_2)$
- $\eta_1\eta_2, E_1E_2(\eta_1 + \eta_2)$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\eta_1E_2 + \eta_2E_1, (E_1 + E_2)\eta_1\eta_2$

5) **Questions 5-9 are based on the figure given below:** *1 point*

Consider an N- Maxwell model as shown in the figure below:



The lowest order of stress σ and strain ϵ terms with non-zero coefficient in the constitutive equation is ___ and ___ respectively.

- 1 & 0
- 1 & 1
- 0 & 1
- 0 & 0

No, the answer is incorrect.
Score: 0
Accepted Answers:
0 & 1

6) For the above N- Maxwell model, which of the following corresponds to the form of creep function? *1 point*

- $J(t) = J_0 + J_1\log(\frac{t}{\lambda_1}) + J_2\log(\frac{t}{\lambda_2}).\dots\dots + J_N\log(\frac{t}{\lambda_N})$
- $J(t) = J_0 + J_1e^{-\frac{t}{\lambda_1}} + J_2e^{-\frac{t}{\lambda_2}}\dots\dots + J_Ne^{-\frac{t}{\lambda_N}}$
- $J(t) = J_0 + J_1\frac{t}{\lambda_1} + J_2\frac{t^2}{2!\lambda_2}\dots\dots + J_N\frac{t^N}{N!\lambda_N}$
- None of this

No, the answer is incorrect.
Score: 0
Accepted Answers:
$J(t) = J_0 + J_1e^{-\frac{t}{\lambda_1}} + J_2e^{-\frac{t}{\lambda_2}}\dots\dots + J_Ne^{-\frac{t}{\lambda_N}}$

7) For the above N-Maxwell model, which of the following represents a possible characteristic time-scale associated with the flow? *1 point*

- $\lambda = \frac{\eta_1+\eta_2}{E_1+E_2}$
- $\lambda = \frac{\eta_1}{E_1+E_2}$
- $\lambda = \frac{\eta_1}{E_1}$
- $\lambda = \frac{\eta_1+\eta_2}{E_1}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\lambda = \frac{\eta_1}{E_1}$

8) For an N- Maxwell model, assume $E = E_1 = E_2 = \dots\dots = E_N$ & $\eta = \eta_1 = \eta_2 = \dots\dots = \eta_N$. Then which of the following represents the correct constitutive model for the system. *1 point*

- $\frac{\dot{\sigma}}{E} + \frac{\sigma}{\eta} = N\dot{\epsilon}$
- $\frac{\dot{\sigma}}{\eta} + \frac{\sigma}{E} = N\dot{\epsilon}$
- $\frac{\dot{\sigma}}{E} + \frac{\sigma}{\eta} = N\epsilon$
- $\frac{\dot{\sigma}}{\eta} + \frac{\sigma}{E} = N\epsilon$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\frac{\dot{\sigma}}{E} + \frac{\sigma}{\eta} = N\dot{\epsilon}$

9) For an N- Maxwell model given in question 8.The expression for stress-relaxation function is: *1 point*

- $G(t) = Ee^{-\frac{Et}{\eta}}$
- $G(t) = NEe^{-\frac{Et}{\eta}}$
- $G(t) = E(e^{-\frac{Et}{\eta}} - 1)$
- $G(t) = NE(e^{-\frac{Et}{\eta}} - 1)$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$G(t) = NEe^{-\frac{Et}{\eta}}$

10) A viscoelastic fluid is prepared on Earth and half of the volume is packaged and sent to the moon for measuring its rheological properties in the Lunar environment. The remaining half is kept on Earth and rheometric experiments are simultaneously carried out using a similar testing apparatus (assume that the temperature and pressure are same in both the setups) . Then which of the following statement is true? *1 point*

- When the strain rate is varied in the same interval in both the setups , the sample on Lunar surface shows a larger variation in dynamic viscosity compared to the setup on earth.
- When the strain rate is varied in the same interval in both the setups , the sample on Lunar surface shows a smaller variation in dynamic viscosity compared to the setup on earth.
- When the strain rate is varied in the same interval in both the setups , the sample on Lunar surface shows a similar variation in dynamic viscosity compared to the setup on earth.
- When the strain rate is varied on the setup on earth, the sample on Lunar surface shows also shows a small variation in dynamic viscosity.

No, the answer is incorrect.
Score: 0
Accepted Answers:
When the strain rate is varied in the same interval in both the setups , the sample on Lunar surface shows a similar variation in dynamic viscosity compared to the setup on earth.