Unit 03: Bending, Yield, Fracture, Buckling and Creep

Author: Stephanie Redfern

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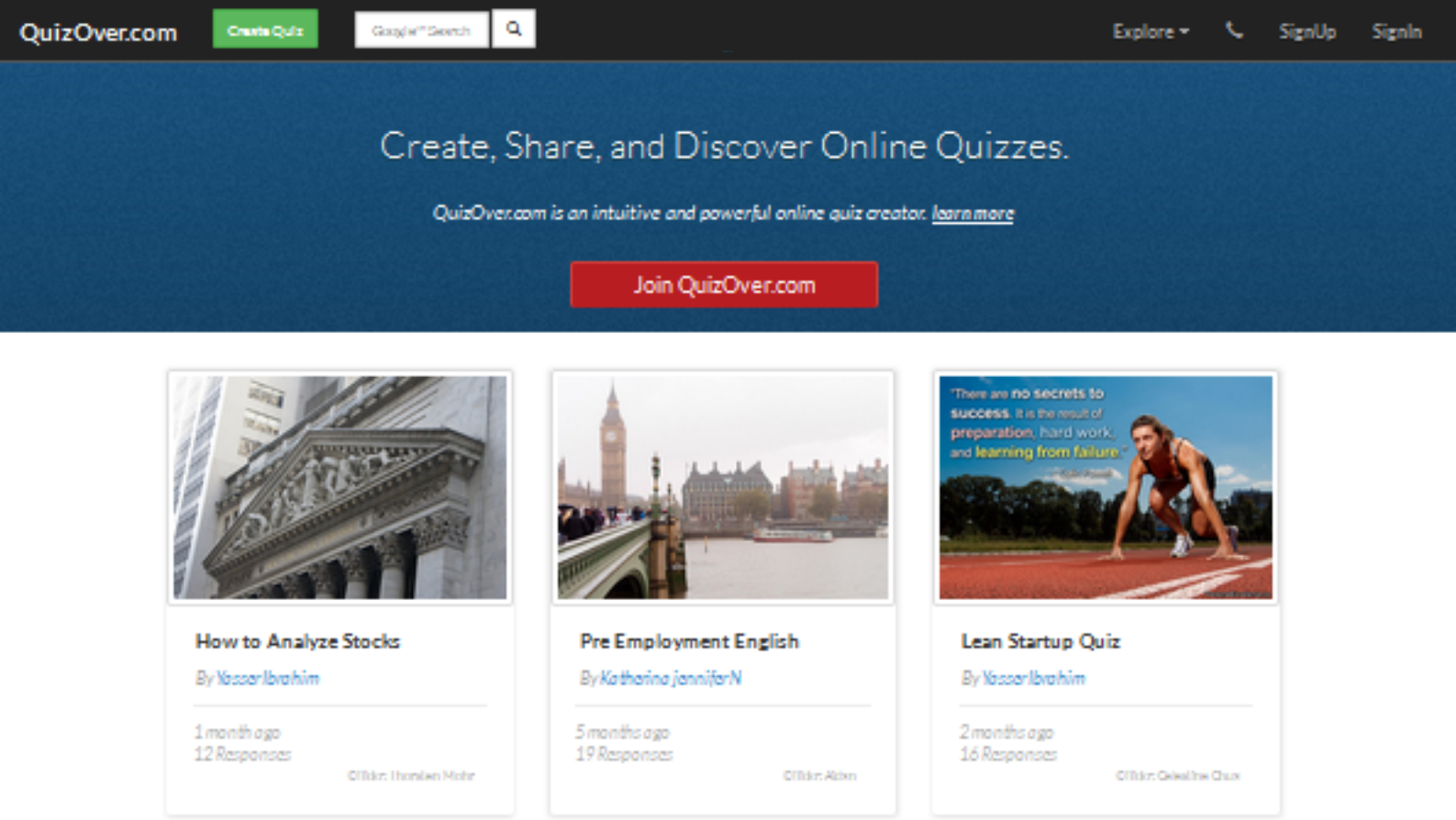

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Stephanie Redfern, Ranjeet (Ron) Agarwala, and Dr. Steve Gibbs. Mechanics I. The Saylor Foundation, http://www.saylor.org/courses/me102/

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4. Chapter: Unit 03: Bending, Yield, Fracture, Buckling and Creep

1. Unit 03: Bending, Yield, Fracture, Buckling and Creep Questions

4.1.1. Which of the following assumptions are necessary in order for the b...

Author: Stephanie Redfern

Which of the following assumptions are necessary in order for the beam deflection equation to be well represented by d[sup]4[/sup]w(x)/dx[sup]4[/sup] EI = q(x)?

I. Constant E

II. Continuously distributed loads only

III. Constant I

Please choose only one answer:

- I only
- II only
- Both II and III
- Both I and II
- I, II, and III

4.1.2. How do beams differ from truss elements?

Author: Stephanie Redfern

How do beams differ from truss elements?

Please choose only one answer:

- Beams are wider and stiffer than truss elements.
- Beams are solid, but truss elements usually have void spaces for weight concerns.
- Beams have more complex cross sections than truss elements.
- Truss elements are usually pin connected and carry only axial loads, but beams may have connections like welds that impart transverse loads.
- Truss elements are subject to bending forces, but beams are not.

4.1.3. For a cantilevered beam with a downward load L at the free end, whi...

Author: Stephanie Redfern

For a cantilevered beam with a downward load L at the free end, which of the following statements is true? I. The shearing force is constant over the length of the beam. II. The magnitude of the bending moment increases linearly from the fixed end to the free end. III. The magnitude of the shearing force increases linearly from the free end to the fixed end. IV. The beam bends so that it is concave up.

Please choose only one answer:

- II, III, and IV
- Both III and IV
- Both II and III
- I only
- Both I and II

4.1.4. Which of the following correctly represents Euler's expression for ...

Author: Stephanie Redfern

Which of the following correctly represents Euler's expression for the critical loading force at which bending begins for a long column? Here, E is Young's modulus, L[sub]eff[/sub] is a measure of column length, A is the cross-sectional area of the column, and I is the area moment of inertia.

Please choose only one answer:

- $$F_{cr} = EI \pi^2/L^2_{eff}$$
- $$F_{cr} = EI \pi^3/L^2_{eff}$$
- $$F_{cr} = EI /L^2_{eff}$$
- $$F_{cr} = EI \pi^2/L^3_{eff}$$
- $$F_{cr} = EI \pi^2/L_{eff}$$

4.1.5. How does creep differ from fatigue?

Author: Stephanie Redfern

How does creep differ from fatigue?

Please choose only one answer:

- Creep refers to slow deformation resulting in change in macroscopic shape; fatigue refers to the weakening of material over time caused by repeated use or loading.
- They do not differ.
- Creep refers to the overall weakening of a material through pressure; fatigue refers to the weakening that occurs at susceptible stress points.
- Creep is temperature dependent; fatigue is not.
- Creep is more significant for very large pieces than fatigue; fatigue is more important for small pieces that fail as a result of small-crack propagation.

4.1.6. Which number of cycles conventionally lies between low-cycle and hi...

Author: Stephanie Redfern

Which number of cycles conventionally lies between low-cycle and high-cycle fatigue?

Please choose only one answer:

- 10
- 1000
- 200,000
- 20,000,000
- 1,000,000,000

4.1.7. Which of the following correctly describes the deflection of a beam...

Author: Stephanie Redfern

Which of the following correctly describes the deflection of a beam of length L, Young's modulus E, area moment of inertia I subjected to a point load P at the center point of the beam?

Please choose only one answer:

- PL^{3}/(48 EI)
- PL^{2}/(48 EI)
- PL^{3}/(48 EI^{2})
- PL^{3}/(48 E^{2}I)
- PL^{3}/(8 EI)

4.1.8. Which of the following best describes the process of fatigue for en...

Author: Stephanie Redfern

Which of the following best describes the process of fatigue for engineering materials?

Please choose only one answer:

- Fatigue is material corrosion that prevents further use.
- Fatigue is the failure or weakening of material caused by repeated or continued stress or loading
- Fatigue is the natural aging of material that leads to failure.
- Fatigue is the weakening of engineering materials caused by thermal cycling and the resulting molecular rearrangements that occur.
- Fatigue is the temporary weakening of materials resulting from continued use; materials may recover strength if random molecular rearrangements are allowed to occur during a period of disuse.

4.1.9. Which of the following statements best describes finite element ana...

Author: Stephanie Redfern

Which of the following statements best describes finite element analysis?

Please choose only one answer:

- It is a numerical method for inverting a matrix or tensor.
- It is a computational technique for solving for stress as a function of strain.
- It is a modeling technique limited to a finite number of engineering pieces.
- It is a useful numerical method limited to linear differential equations.
- It is a numerical method for approximating solutions to differential and other equations.

4.1.10. Why did full-scale engineering-material specimens fracture at lower...

Author: Stephanie Redfern

Why did full-scale engineering-material specimens fracture at lower loads than expected in early metal airplanes (see specifically the Comet 1)? I. The effects of cyclic fatigue were not appreciated for airplane pressurization/depressurization. II. The effects of stress concentration at the corners of square windows were not appreciated. III. The effects of defect presence and growth were not appreciated for large structures

Please choose only one answer:

- I only
- Both II and III
- I, II, and III
- Both II and III
- Both I and III

4.1.11. Which of the following is a correct definition of Poisson's ratio?

Author: Stephanie Redfern

Which of the following is a correct definition of Poisson's ratio?

Please choose only one answer:

- It is the ratio of transverse strain to normal strain, resulting from normal stress.
- It is the ratio of specimen volume upon compression with a known stress to that without compression.
- It is the ratio of the rebound length of a material specimen after temporary extension to its initial length.
- It is the ratio of shear stress to normal stress.
- It is the ratio of shear strain to normal strain.

4.1.12. Which of the following are well-established experimental tools for ...

Author: Stephanie Redfern

Which of the following are well-established experimental tools for determining localized strains in engineering pieces? I. Localized electrical resistance measurements in strain gauges II. Optical methods based on photoelasticity III. Ultrasonic displacement mapping IV. X-ray or computed tomography

Please choose only one answer:

- II only
- Both II and III
- Both I and IV
- Both I and II
- I, II, III, and IV