CSWA – Simulation Preparation Test

SOAL TEORI

1. What is the Modulus of Elasticity?
   - The slope of the Deflection-Stress curve
   - **The slope of the Stress-Strain curve in its linear section**
   - The slope of the Force-Deflection curve in its linear section
   - The first inflection point of a Strain curve
2. What is Stress?
   - A measure of power
   - A measure of strain
   - A measure of material strength
   - **A measure of the average amount of force everted per unit area**
3. Which of the following assumptions are true for a static analysis in SOLIDWORKS Simulation with small displacements?
   - **Inertia effects are negligible and loads are applied slowly**
   - The model is not fully elastic. If loads are removed, the model will not return to its original position
   - **Results are proportional to loads**
   - **All the displacements are small relative to the model geometry**
4. In SOLIDWORKS Simulation, the Factor of Safety (FOS) calculations are based on one of the following failure criteria.
   - **Maximum von Mises Stress**
   - **Minimum shear stress (Tresca)**
   - **Mohr-coulomb stress**
   - **Minimum Normal stress**

Summary of Failure Criteria

The following table summarizes the failure criteria used to assess the safety of designs.

Criterion	Factor of Safety	Material Type
Maximum von Mises stress	$\sigma_{limit} / \sigma_{vonMises}$	Ductile
Maximum shear stress	$\sigma_{limit} / (2 * \tau_{max})$	Ductile
Mohr-Coulomb stress	• If ($\sigma_1 > 0$ and $\sigma_3 > 0$) then ($\sigma_1 \geq \sigma_{TensileLimit}$) • If ($\sigma_1 < 0$ and $\sigma_3 < 0$) then ($\sigma_3 \geq -\sigma_{CompressiveLimit}$) • If ($\sigma_1 \geq 0$ and $\sigma_3 \leq 0$) then ($\sigma_1 / \sigma_{TensileLimit} + \sigma_3 / -\sigma_{CompressiveLimit} \geq 1$)	Brittle materials with different tensile and compressive strengths
Maximum normal stress	$\sigma_{limit} / \sigma_1$	Brittle
Maximum stress criterion (composites)	$F.I. = Max\left(\frac{\sigma_1}{X_1}, \frac{\sigma_2}{X_2}, \left\lvert\frac{\sigma_{12}}{S_{12}}\right\rvert\right)$ FOS = 1 / F.I.	Brittle 1 and 2 stand for material directions. X and S are normal and shear strengths of the composite.
Tsai-Hill Failure criterion (composites)	$F.I. = \frac{\sigma_1^2}{X_1^2} - \frac{\sigma_1\sigma_2}{X_1^2} + \frac{\sigma_2^2}{X_2^2} + \frac{\tau_{12}^2}{S_{12}^2}$ FOS = 1 / SQRT (F.I.)	Brittle
Tsai-Wu Failure criterion (composites)	$F_1\sigma_1 + F_2\sigma_2 + 2F_{12}\sigma_1\sigma_2 + F_{11}\sigma_1^2 + F_{22}\sigma_2^2 + F_6\tau_{12} + F_{66}\tau_{12}^2 = 1$ $F_1 = \left(\frac{1}{X_1^T} - \frac{1}{X_1^C}\right), F_2 = \left(\frac{1}{X_2^T} - \frac{1}{X_2^C}\right), F_{12} = -\frac{1}{2}\sqrt{\frac{1}{X_1^T * X_1^C} * \frac{1}{X_2^T * X_2^C}}$, $F_{11} = \frac{1}{X_1^T X_1^C}, F_{22} = \frac{1}{X_2^T X_2^C}, F_6 = \left(\frac{1}{X_{12}^T} - \frac{1}{X_{12}^C}\right), F_{66} = \frac{1}{X_{12}{}^T * X_{12}{}^C}$	Brittle

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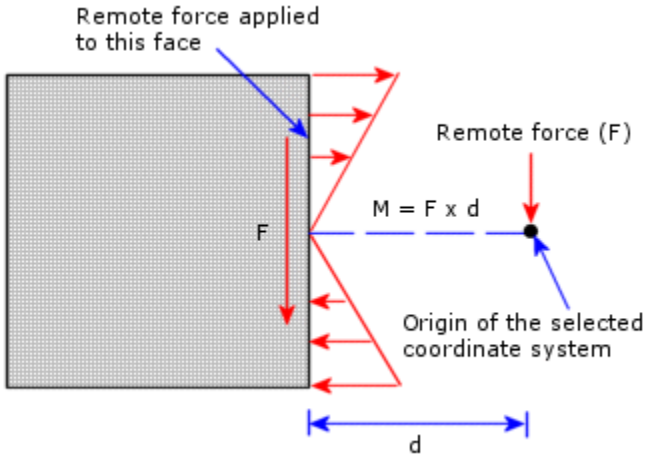
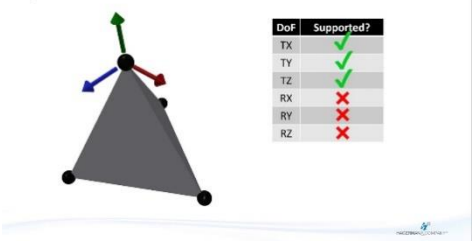
5. Use the mesh and displacement plots to calculate the distance between two _____ using SOLIDWORKS Simulation.
   - **Nodes**
   - Elements
   - Bodies
   - Surfaces
6. Surface models can only be meshed with _____ elements.
   - **Shell**
   - Beam
   - Mixed Mesh
   - Solid
7. The shell mesh is generated on the surface (located at the mid-surface of the shell).
   - **True**
   - False
8. A remote load applied on a face with a Force component and no Moment can result in: Note: Remember (D0Fs restrain).
   - **A Force and Moment of the face**
   - A Force on the face only
   - A Moment on the face only
   - A Pressure and Force on the face





9. There are _____ DOFs restrain for a **Solid element**
   - **3**
   - 1
   - 6
   - None .
10. There are _____ DOFs restrain for a **Beam element**.
   - 3
   - 1
   - **6**
   - None

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	Truss	Beam
Look		
Number of nodes	2	2
Degree of freedom per node	Translations X, Y (2D) Translations X, Y, Z (3D)	Translations X, Y (2D) Translations X, Y, Z (3D) Rotations R_Z (2D) Rotations R_X, R_Y, R_Z (3D)
For modelling	Constant axial stress only	Axial, bending, transverse shear and torsional stresses

11. What best describes the difference(s) between a **Fixed** and **Immovable** (No translation) boundary condition in SOLIDWORKS Simulation?
    - There are no differences
    - There are no difference(s) for Shells but it is different for Solids
    - **There is no difference(s) for Solids but it is different for Shells and Beams**
    - There are only differences(s) for a Static Study
12. Can a non-uniform pressure of force be applied on a face using SOLIDWORKS Simulation?
    - No
    - Yes, but the variation must be along a single direction only
    - **Yes. The non-uniform pressure distribution is defined by a reference coordinate system and the associated coefficients of a second order polynomial**
    - Yes, but the variation must be linear
13. You are performing an analysis on your model. You select **five faces**, **3 edges** and **2 vertices** and apply a force of 20lbf. What is the total force applied to the model using SOLIDWORKS Simulation?
    - 100 lbf
    - 1600 lbf
    - 180 lbf
    - 200 lbf
14. Brittle material has little tendency to deform (or strain) before fracture and does not have a specific yield point. It is not recommended to apply the yield strength analysis as a failure criterion on brittle material. Which of the following failure theories is appropriate for brittle materials?
    - **Mohr-Columb stress criterion**
    - Maximum shear stress criterion
    - Maximum von Mises stress criterion
    - Minimum shear stress criterion
15. You are performing an analysis on your model. You select **three faces** and apply a force of 40 lb. What is the total force applied to the model using SOLIDWORKS Simulation?
    - 40 lb
    - 20 lb
    - **120 lb**
    - Additional information is required

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16. ~~A material is orthotropic if its mechanical or thermal properties are not unique and independent in three mutually perpendicular directions.~~
    - ~~True~~
    - ~~**False**~~
17. An increase in the number of elements in a mesh for a part will:
    - Decrease calculation accuracy and time
    - **Increase calculation accuracy and time**
    - Have no effect on the calculation
    - Change the FOS below 1
18. ~~SOLIDWORKS Simulation uses the **von Mises Yield Criterion** to calculate the **Factor of Safety** of many **ductile** materials. According to the criterion:~~
    - ~~**Material yields when the von Mises stress in the model equals the yield strength of the material**~~
    - ~~Material yields when the von Mises stress in the model is 5 times greater than the minimum tensile strength of the material~~
    - ~~Material yields when the von Mises stress in the model is 3 times greater than the FOS of the material~~
    - ~~None of the above~~
19. SOLIDWORKS Simulation calculates structural failure on:
    - Buckling
    - Fatigue
    - Creep
    - **Material yield**
20. Apply a uniform total force of 200 lb on two faces of a model. The two faces have different areas. How do you apply the load using SOLIDWORKS Simulation for a Linear Static Study?
    - Select the two faces and input a normal to direction force of 200 lb on each face
    - Select the two faces and a reference plane. Apply 100 lb on each face
    - **Apply equal force to the two faces. The force on each face is the total force divided by the total area of the two faces.**
    - None of the above
21. Maximum and Minimum value indicators are displayed on Stress and Displacement plots in SOLIDWORKS Simulation for a linear Static Study.
    - **True**
    - False
22. What SOLIDWORKS Simulation tool should you use to determine the result values at specific locations (nodes) in a model using SOLIDWORKS Simulation?
    - Section tool
    - **Probe tool**
    - Clipping tool
    - Surface tool
23. in SOLIDWORKS Simulation, What criteria are best suited to **check the failure of ductile materials?**
    - Maximum von Mises Strain and Maximum Shear Strain criterion
    - **Maximum von Misses Stress and Maximum Shear Stress criterion**
    - Maximum Mohr-Coulomb Stress and Maximum Mohr-Coulomb Shear Strain criterion
    - Mohr-Coulomb Stress and Maximum Normal Stress criterion

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Summary of Failure Criteria

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24. Set the **scale factor for plots** _____ to avoid any misinterpretation of the results, after performing a Static analysis with gap/contact elements.
    - Equal to 0
    - **Equal to 1**
    - Less than 1
    - To the Maximum displacement value for the model
25. To avoid any misinterpretation of the results, after performing a static analysis with gap/contact elements the scale factor for plots should be set
    - Equal to 0
    - **Equal to 1**
    - Less than 1
    - To the Maximum displacement value for the model

26. To Improve accuracy of the results, adaptive methods can be used. The H-Method increases the _____ with each iteration. (if you unsure, check the documentation)
    - Meshing tolerance
    - **Number of elements**
    - Element aspect ratio
    - Element shape polynomial order

SolidWorks Simulation uses two different methods to accomplish this: h-adaptive and p-adaptive meshing.
H-adaptive meshing physically adjusts the size of the mesh cell in areas of the model where smaller mesh is needed
while p-adaptive meshing adjusts the polynomial order of the mesh to improve accuracy.
This is all done automatically by the software based on a desired accuracy defined by the user.

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1). h – method
2). p – method
The h- and p- versions of the finite element method are different ways of adding degrees of freedom (dof) to the model **(Figure 1).**

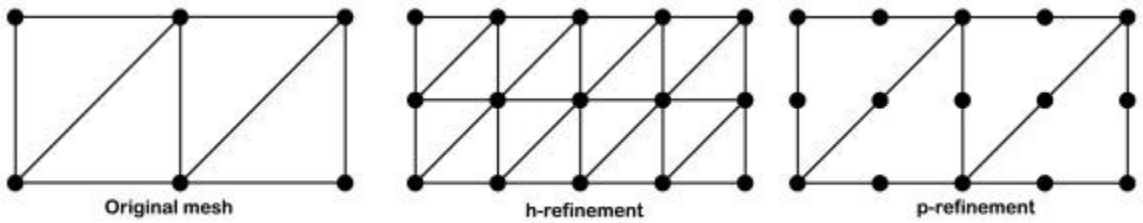

Figure 1.

h-method –> The h-method improves results by using a finer mesh of the same type of element. This method refers to decreasing the characteristic length (h) of elements, dividing each existing element into two or more elements without changing the type of elements used.
p-method –> The p-method improves results by using the same mesh but increasing the displacement field accuracy in each element. This method refers to increasing the degree of the highest complete polynomial (p) within an element without changing the number of elements used.

27. To Improve accuracy of the results, adaptive methods can be used. The P-Method increases the _____ with each iteration. (if you unsure, check the documentation)
    - Aspect ratio
    - **Polynomial order**
    - Meshing tolerance
    - Number of element

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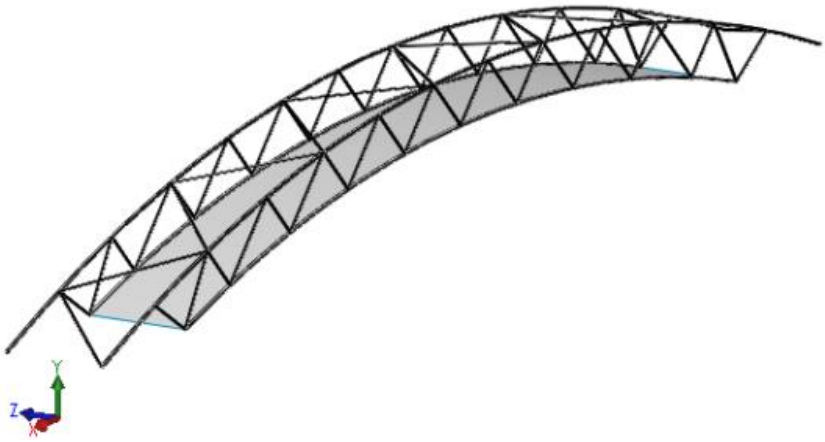
28. Is it possible to simulate the crushing of ping pong ball in a static analysis in Solidworks Simulation?

- Yes
- **No**

29. Is it possible to simulate the deflection of a bridge due to a crowd **standing** on it, in a static solidworks Simulation ?



- **Yes**
- No

30. Is it possible to simulate the deflection of a bridge due to a crowd **jumping** on it, in a static solidworks Simulation ?

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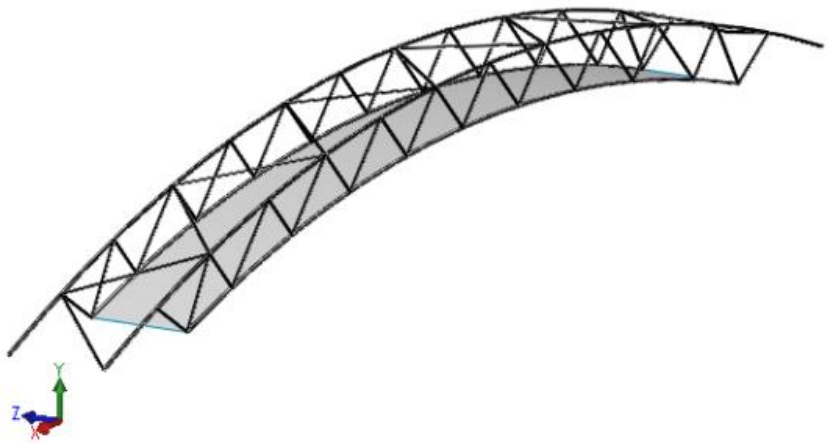

- Yes
- **No**

31. A Force “F” applied in a static analysis produce a resultant displacement URES. If the force is now 2*F and the mesh is not changed, then URES will:
    - Be divided by 2 if contacts are specified
    - **Double if there is no source of nonlinearity in the study (like contacts or large displacement option)**
    - Double if there are no contacts specified and there are large displacement in the structure
    - The analysis must be run again to find out

32. Is it possible to simulate the deflection of a bridge due to **a crowd standing on it**, in a static study in Solidworks Simulation?
    - **Yes**
    - No

33. Is cyclic symmetry another name of axisymmetry ?
    - Yes
    - **No**

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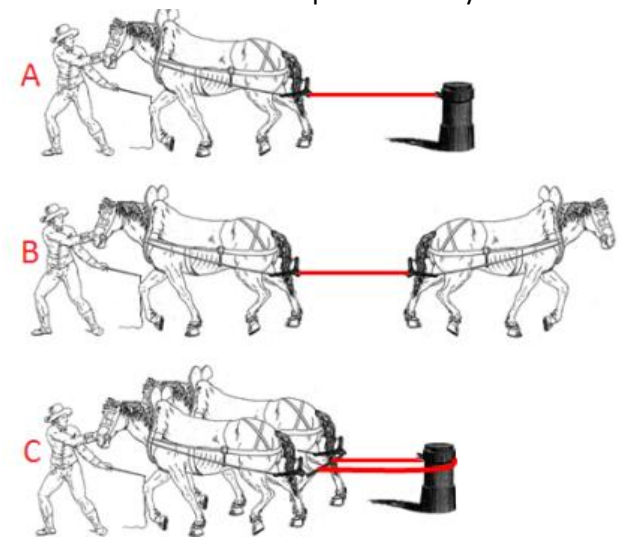
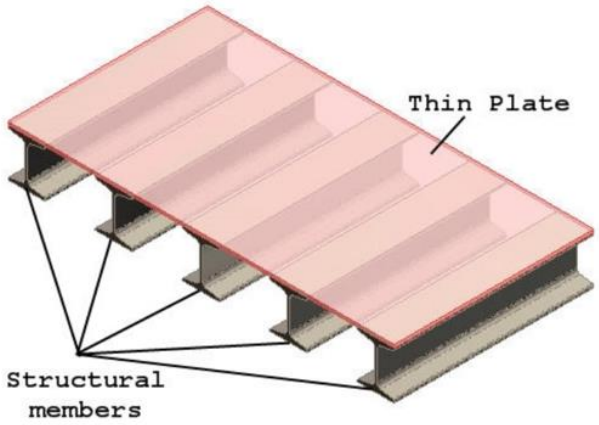
34. In which case is the red rope most likely to break? Each horse pulls with the same force



- C
- A
- B
- **It's the same**

35. A thin sheet metal plate is stiffened by structural members as shown. How will you set up this model?



- Mesh the thin plate with shell and define the structural member as beams. Define rigid connector between each structural member and the shell surface
- **Mesh the thin plate with shell and define the structural member as beams. Define a bonded contact type between each structural member and the shell surface**

36. Which result are available for a bolt connector? There can be more than one answer

- **Axial Force**
- **Shear Force**
- **Bending Moments**
- **Calculated Factor of Safety**
- **Stresses**

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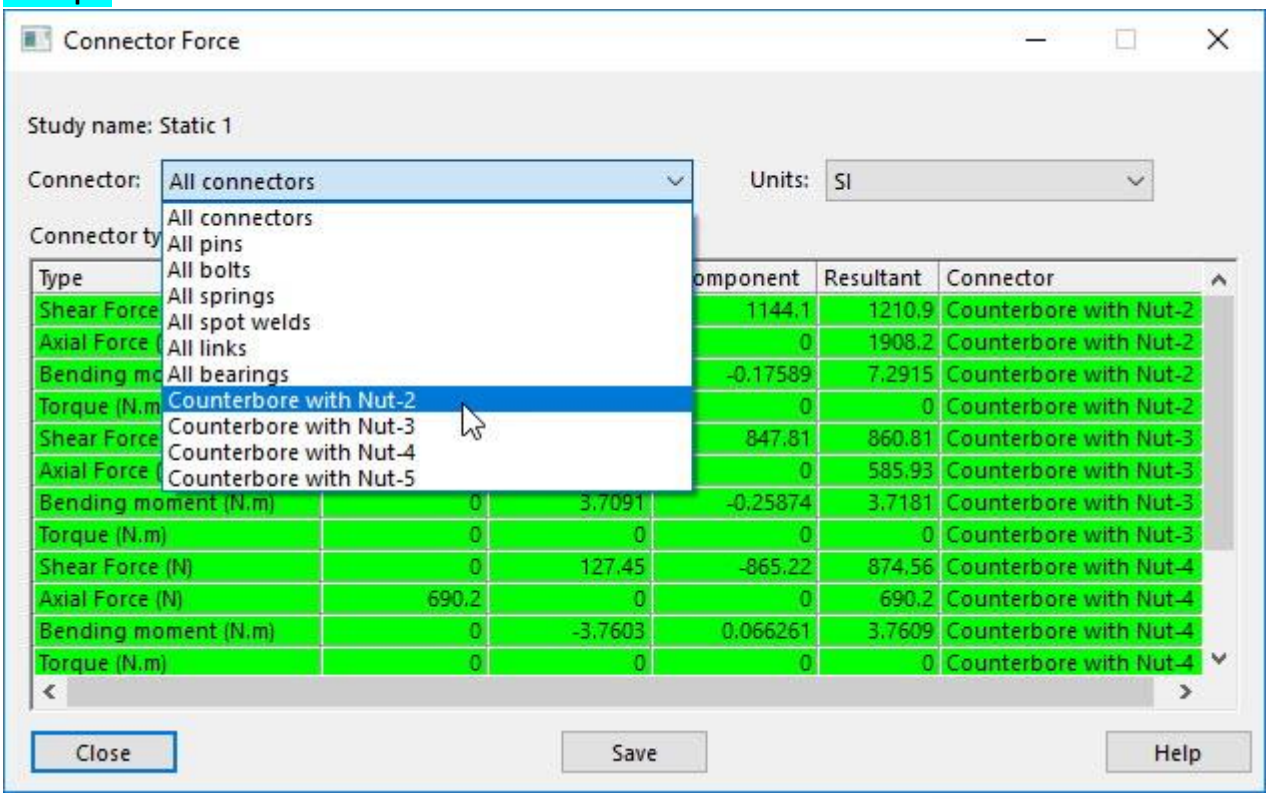
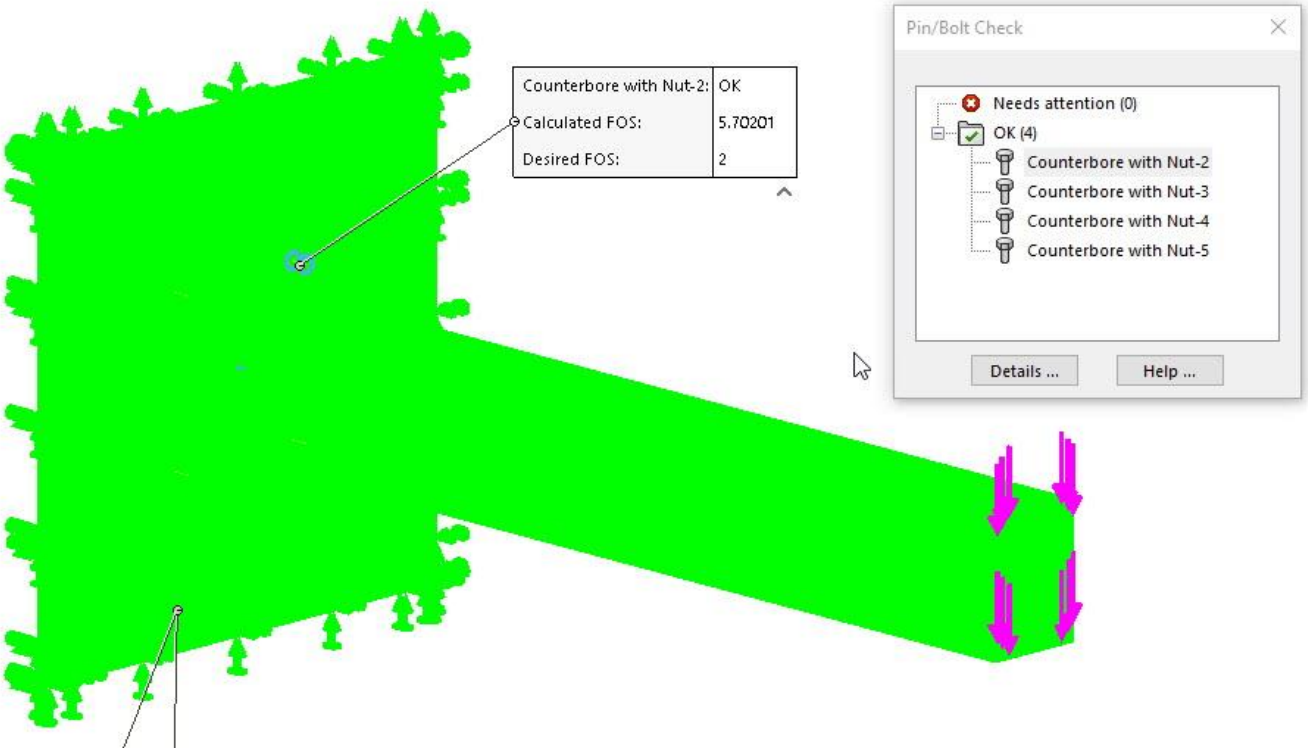
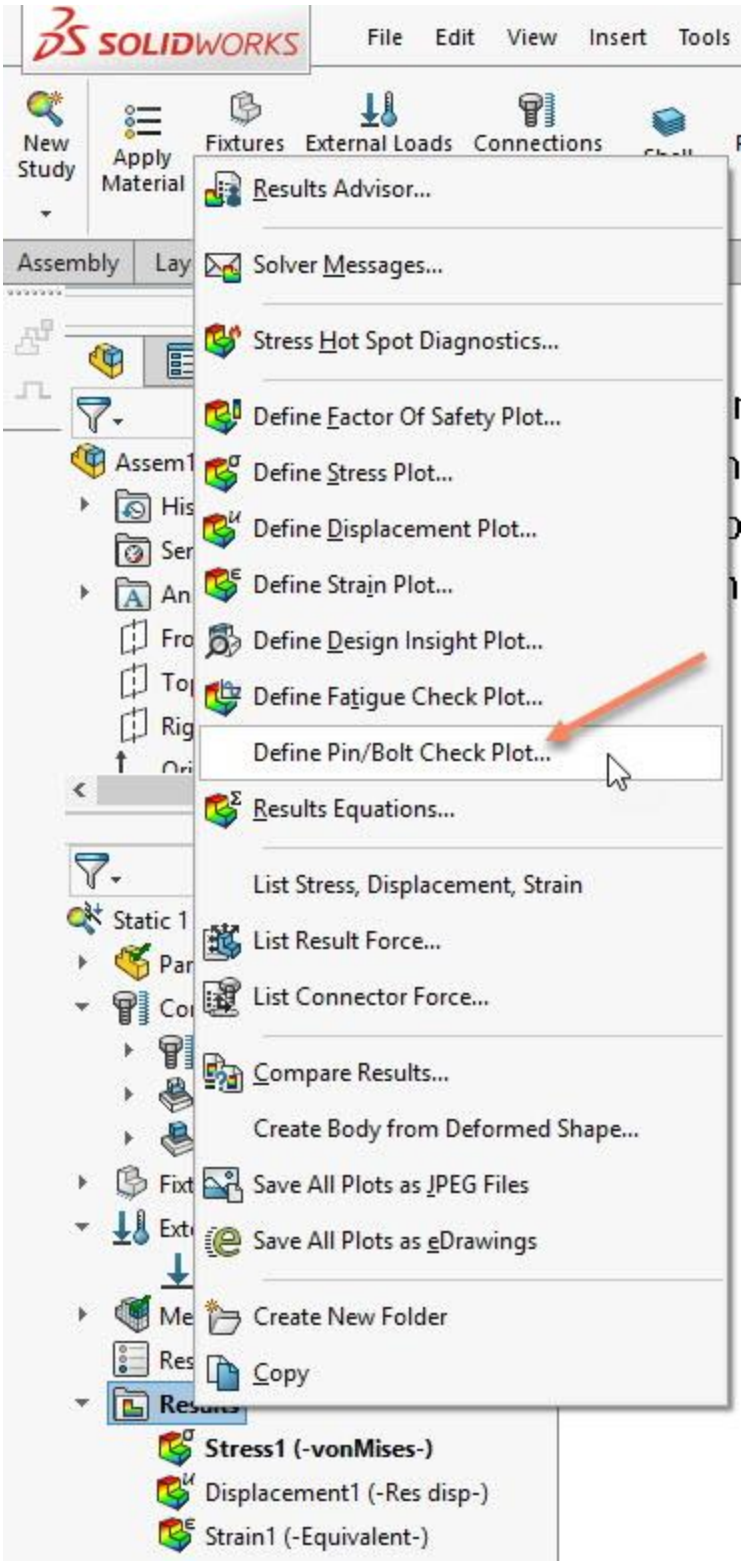
• Torque





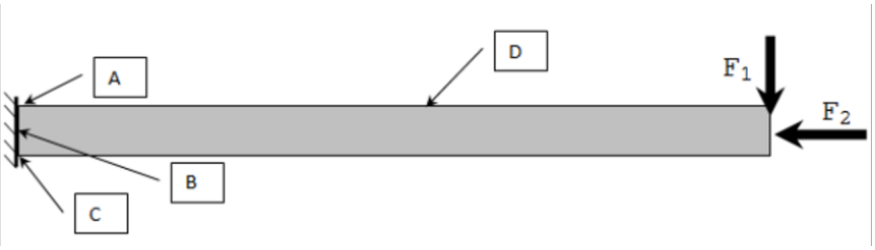


37. Can you calculate the distance between two nodes in a Solidworks Simulation result plot?
    - Yes for all plot
    - No
    - Yes, for strain plot only

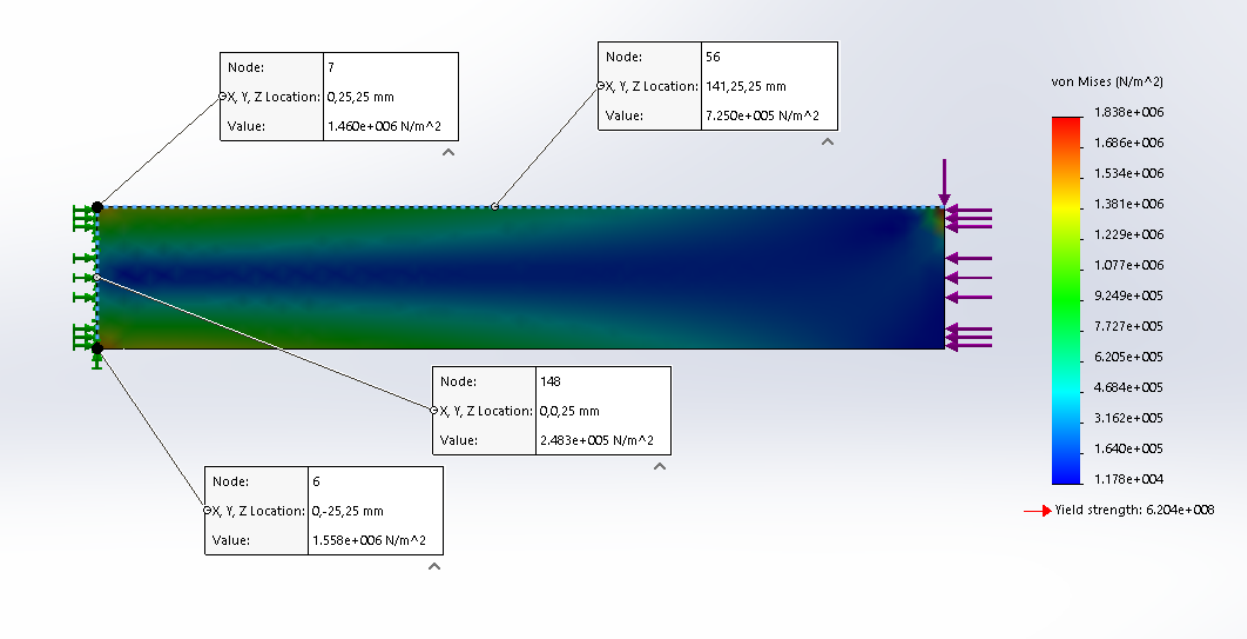
- **Yes, for mesh and displacement only**

38. A force "F" applied in a static analysis produces a resultant displacement URES. If the force is now 2*F and the mesh is not changed, then URES will:
    - Be divided by 2 if contacts are specified
    - Double if there is no contats specified and there are large displacement in the structure
    - **Double if there is no source of nonlinearity in the study (like contacts or large displacement option)**
    - The analysis must be run again to find out

39. Where will the maximum stress be?



- A
- B
- **C**
- D



40. Which of the following is true about mutibody parts in solidwroks simulation? There can be more than one answer.
    - **You can define contact condition between multiple solid bodies**
    - **You can apply different mesh controls to each solid body**
    - **You can define a different material for each solid body**

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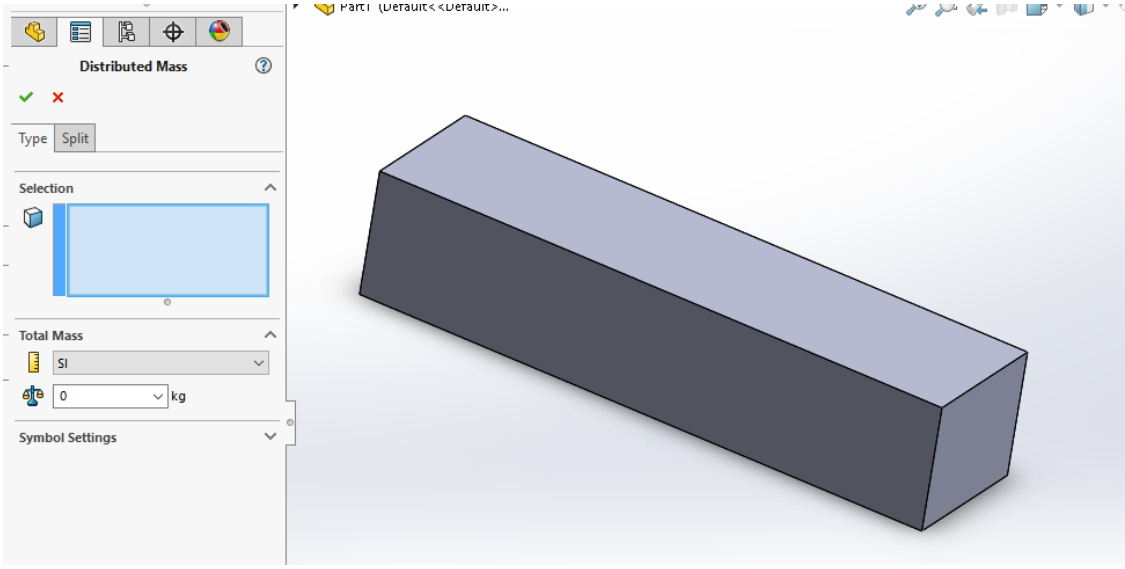
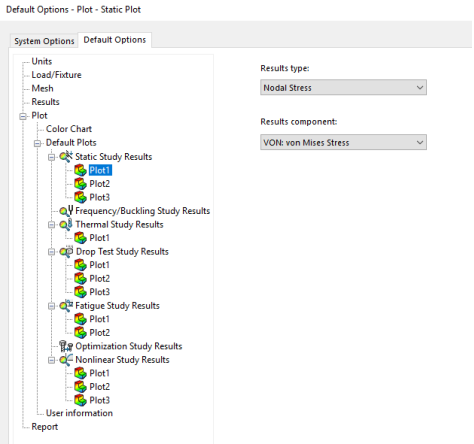
41. Which of the following is true about “Distributed Mass” load in a static analysis? There can be more than one answer.
    - **It has to be used in conjunction with gravity or centrifugal load**
    - Moment effects due to mass are also considered, thus the X, Y, and Z location of the mass needs to be specified
    - **The mass is assumed to be uniformly distributed on selected faces on their area**
    - A “Distributed Mass” increases the stiffness of the face to which it is applied



42. The default plots for the Solidworks Simulation results, setup under Solidworks Simulation Options, allows you to:
    - Automatically load results upon opening the SolidWorks file
    - **Select plots that you want the program to generate automatically in the simulation study tree after running a study**
    - None of the other answer is correct
    - Control the display of the results folder in the Simulation study tree



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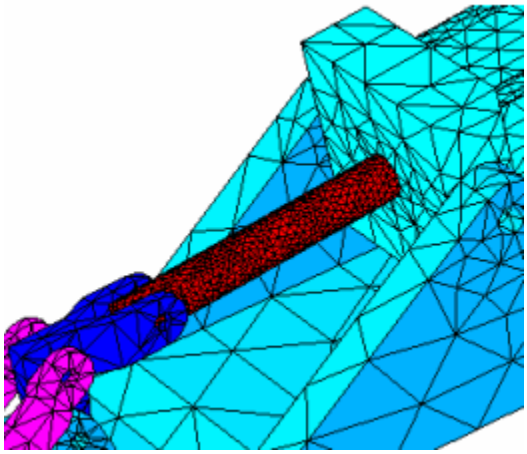
43. Which are the following assumptions are true for static analysis in Solidworks simulation? There can be one answer
    • All displacement are small relative to the model geometry (unless Large Displacemnt are activated)
    • Result are proportional to loads (exception: Large Displacement, No penetration, Shrink fit or virtual wall contacts conditions are present)
    • The model is not fully elastic. If loads are removed, the model will not return to its original position
    • Inertia effect are negligible and loads are applied slowly

44. The statement that the displacement at a particular location in a specific direction can be larger than the resultant displacement at that location is :
    • **False for all type of models**
    • True only for shell model
    • True only for contact proclem
    • True for all type of models

45. Which of the following is true about multibody parts in SolidWorks Simulation?
There can be more than one answer.

    • You can contact conditions between multiple solid bodies
    • You can apply different mesh controls to each solid body
    • You can define a different material for each solid body



2018 SOLIDWORKS Help - Incremental Meshing

46. A 20 inches long beam of cross section C is foxed at one end. A tensile force of 100Lbs is applied to the other end.
    The beam is made of steel with Young's modulus E=3E7 psi.
    The tensile stress is found to be 1000 psi.
    Suppose the beam was made of titanium with E=1.5E7 psi (everything else remains the same). What would the tensile stress be?

- 500 psi
- **1000 psi**
- 2000 psi
- 100 psi

47. In the Mesh Property Manager, Global size refer to
    - The Smallest element size of the mesh
    - **The Average element size of the mesh away from the mesh controls**
    - The largest elemen size of the mesh
    - None of the other answer is correct

Global Size	Available for standard mesh only. Sets the global average element size.

The global element size in SOLIDWORKS Simulation refers to the average length of an element edge.

48. Can a non uniform pressure or force be applied on a face in SolidWorks Simulation?
    - Yes but the variation must be linear
    - **Yes The variation can be two directions and is described by a binomial equation**
    - No, Only uniform pressure is supported by SolidWorks Simulation
    - Yes but the variation must be along one direction only
49. Is it possible to mesh a model with a combination of solid, shell, and beam elements in Solidworks Simulation?
    - No
    - Yes, but only for parts
    - Yes, but only with draft quality mesh
    - **Yes, for both parts and assemblies**
50. The _____ tool can be used to determine the result value at specific location (nodes) in a model in Solidoworks Simulation:
    - Section
    - Clipping
    - **Probe**
    - Iso Surface
51. In order to look at only portions of your model that lie between a range of stress value, which the following would you do?
    - Create an iso plot with two iso values such that they correspond to the lower and upper limits of desired stress range
    - This is not possible in Solidworks Simulation
    - Change the range of the chart legend to display the stress values in the desired range
    - **Create a section plot with two section clipping, each of which serves as the upper or the lower limit of the stress range desired**

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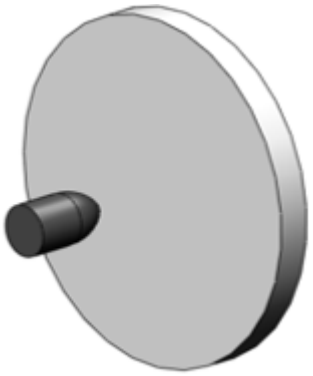
52. Is it possible to simulate the impact of a bullet made out of lead onto a steel plate in a static study in Solidworks Simulation?
    - Yes
    - **No**



53. As a result of an applied load, 2 plates, initially separated by a small clearance gap, **come into contact with each other**. The type of contact condition must be employed between the plates to solves this problem correctly in SolidWorks is:
    - No need to define anything: The program will detect the contact automatically and take it into account
    - Node to surface or surface to surface no penetration contact
    - **Bonded contact**
    - Shrink fit contact

54. Is it Possible to mesh a model with a combination of solids, shells and beam elements in SolidWorks Simulation>
    - **Yes, for both parts and assemblies**
    - Yes, but only for parts
    - Yes, but only with draft quality mesh
    - No

55. When using mesh control, which of the following best describes the Ratio value in the Mesh Control Property Manager?
    (if you unsure, check the documentation)
    - **The maximum ratio of the longest edge to the shortest edge of any element (i.e maximum aspect ratio)**
    - The maximum depth to which the mesh control affect the mesh size, expressed as a fraction of the overall model
    - Yes, but only with draft quality mesh
    - No

56. Which of the following geometries can be meshed using beam elements?
    There can be more than one answer.

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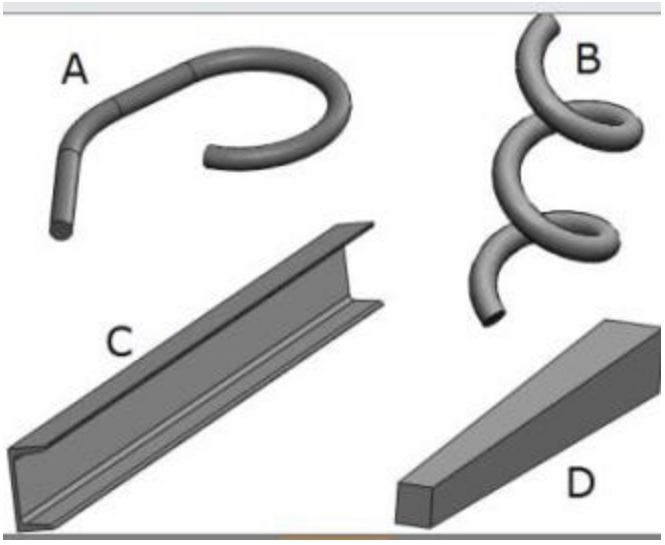
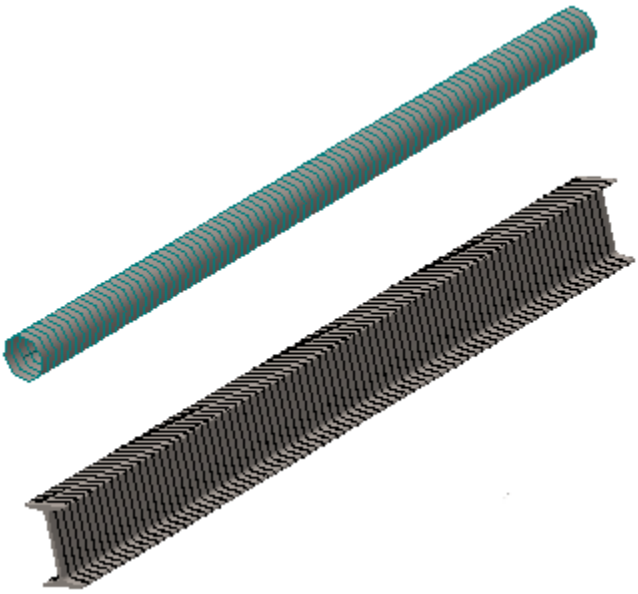
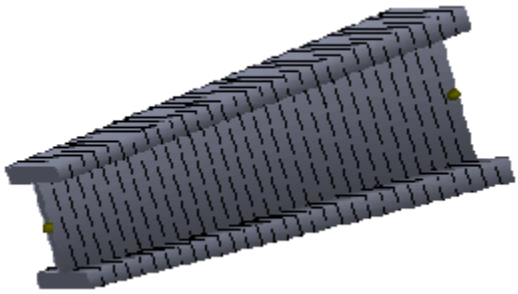
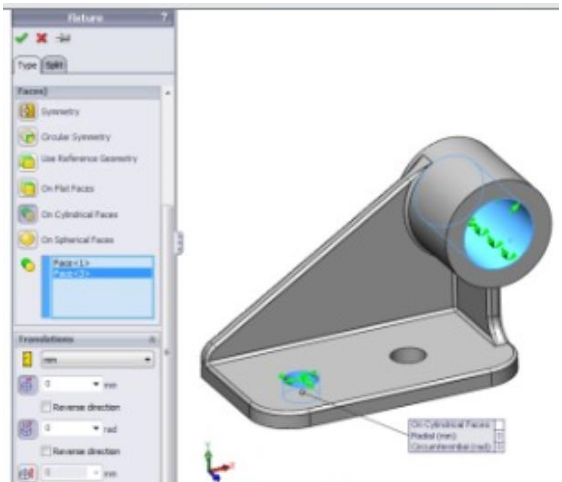


- A
- B
- **C**
- **D**





57. Is the part completely constrained by the fixture shown in image



- **Yes**
- No

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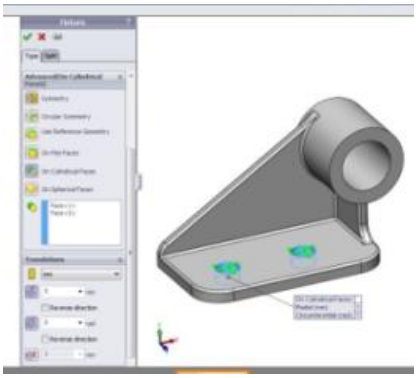
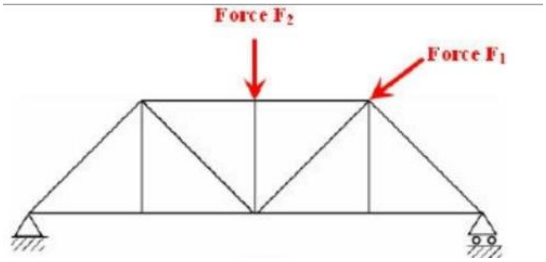
58. Is the part completely constrained by the fixture shown in image



- Yes
- **No**

The **Aspect Ratio** is looking for excessively distorted elements through the ratio of the difference in element edge length, element normal length and radius of inscribed/circumscribed circles.

59. The structure shown in the figure is best analyzed using:

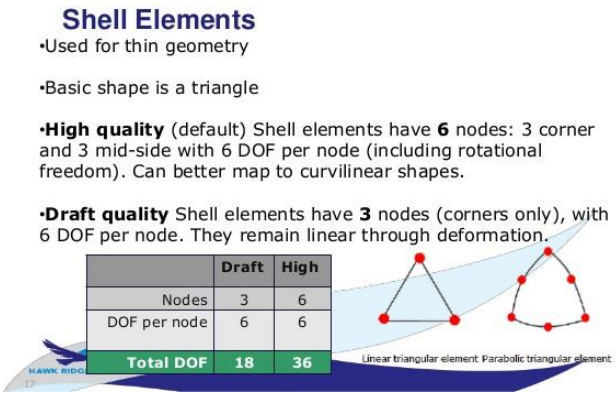


- A mixture of solid, shell, and beam elements
- Solid elements
- Shell elements
- **Beam elements**

60. A Force of 100 lbs, is applied to a selection of 5 faces, 2 edges, and 2 vertices. What is the total magnitude of the force (in lbs) SolidWorks Simulation apply ?
    - 300
    - **900**
    - 500
    - 100
61. Solid meshing an assembly with interferences for a SolidWorks Simulation static analysis is
    - Advisable only if the node-tonode contact or shrink fit contact conditions are defined
    - Not advisable at all
    - **Advisable only if the shrink fit contact condition is defined**
    - Advisable if the sparse solver will be used for the solution

62. What is Yield Stress?
    - **The stress level beyond which the material becomes plastic**
    - The stress level beyond which the material breaks
    - The strain level above the stress level which the material breaks
    - The stress level beyond the melting point of the material
63. A high quality Shell clement has _____ nodes.
    - 4

- 5
- **6**
- 8



64. Stress **σ** is proportional to _____ in a Linear Elastic Material.
    - **Strain**
    - Stress
    - Force
    - Pressure

65. The Elastic Modulus (Young's Modulus) is the slope defined as _____ divided by _____
    - Strain, Stress
    - **Stress, Strain**
    - Stress, Force
    - Force, Area

66. linear static analysis assumes that the relationship between loads and the induced response is _____
    - Flat
    - **linear**
    - Doubles per area
    - Translational

67. The Yield point is the point where the material begins to deform at a faster rate than at the elastic limit. The material behaves _____ in the Plastic Range.
    - Flatly
    - Linearly
    - **Non-Linearly**
    - Like a liquid

68. What are the Degrees of Freedom (DOFs) restrained for a **Solid**?
    - None
    - **3 Translations**
    - 3 Translations and 3 Rotations
    - 3 Rotations

69. What are the Degrees of Freedom (DOFs) restrained for **Truss joints**?
    - None
    - **3 Translations**

- 3 Translations and 3 Rotations
- 3 Rotations

70. What are the Degrees of Freedom (DOFs) restrained for **Shells and Beams**?
    - None
    - 3 Translations
    - **3 Translations and 3 Rotations**
    - 3 Rotations
71. Which statements are **true** for Material Properties using SOLIDWORKS Simulation?
    - **For solid assemblies, each component can have a different material**
    - For shell models, each shell cannot have a different material and thickness
    - **For shell models, the material of the part is used for all shells**
    - For beam models, each beam cannot base a different material
72. A Beam element has _____ nodes (one at each end) with _____degrees of freedom per node plus _____ node to define the orientation of the beam cross section.
    - 6, 3, 1
    - 3, 3, 1
    - **3, 6, 1**
    - None of the above
73. A Truss element has _____ nodes with _____ translational degrees of freedom per node.
    - **2, 3**
    - 3, 3
    - 6, 6
    - 2, 2
74. In general, the finer the mesh the better the accuracy of the results.
    - **True**
    - False
75. How does SOLIDWORKS Simulation automatically treat a Sheet metal part with uniform thickness?
    - **Shell**
    - Solid
    - Beam
    - Mixed Mesh
76. In general, use Thin shells when the thickness-to-span ratio is less than
    - **0.05**
    - .5
    - 1
    - 2
77. The model (a rectangular plate) has a length to thickness ratio of less than 5. You extracted its mid-surface to use it in SOLIDWORKS Simulation. You should use a
    - Thin Shell element formulation
    - **Thick Shell element formulation**
    - Thick or Thin Shell clement formulation, it does not matter
    - Beam Shell element formulation
78. The model, a rectangular sheet metal part, uses SOLIDWORKS Simulation, You should use a:
    - **Thin Shell element formulation**

- Thick Shell element formulation
- Thick or Thin Shell element formulation, it does not matter
- Beam Shell element formulation

79. The Global clement size parameter provides the ability to set the global average element size. SOLIDWORKS Simulation suggests a default value based on the model volume and _____ area. This option is only available for a standard mesh.
    - Force
    - Pressure
    - **Surface**
    - None of the above
80. Yield strength is typically determined at strain.
    - 0.1%
    - **0.2%**
    - 0.02%
    - 0.002%
81. There are four key assumptions made in linear Static Analysis: 1. Effects of inertia and damping are neglected. 2. The response of the system is directly proportional to the applied loads, 3. Loads are applied slowly and gradually, and _____.
    - **Displacements are very small. The highest stress is in the linear range of the stress-strain curve**
    - There are no loads
    - Material is not elastic
    - loads are applied quickly
82. How many degrees of freedom does a physical structure have?
    - Zero
    - Three - Rotations only
    - Three – Translation, only
    - **Six - three translations and three rotational**
83. Use the _____ and _____ plots to calculate the distance between two nodes using SOLIDWORKS Simulation.
    - **Mesh and Displacement**
    - Displacement and FOS
    - Resultant Displacement and FOS
    - None of the above
84. It is possible to mesh _____ with a combination of Solids, Shells and Beam elements in SOLIDWORKS Simulation.
    - **Parts and Assemblies**
    - Only Parts
    - Only Assemblies
    - None of the above
85. SOLIDWORKS Simulation supports multi-body parts. Which of the following is a true statement?
    - You can employ different mesh controls to each Solid body
    - You can classify Contact conditions between multiple Solid bodies
    - You can classify a different material for each Solid body
    - **All of the above are correct**

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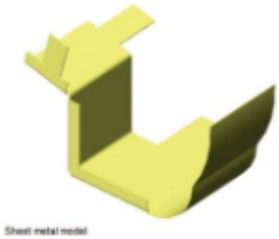
86. The structure displayed in the following illustration is best analyzed using:
    - **Shell elements**
    - Solid elements
    - Beam elements
    - A mixture of Beam and Shell elements



87. The structure displayed in the following illustration is best analyzed using:
    - Shell elements
    - **Solid elements**
    - Beam elements
    - A mixture of Beam and Shell elements

88. Surface models can only be meshed with elements.
    - **Shell elements**
    - Solid elements
    - Beam elements
    - A mixture of Beam and Shell elements