**Multiple Choice Quiz: Section 4.5: Hygrothermal Effects in a Laminate**

_____ 1. Which of the following will expand the most with temperature?

A Aluminum.

B Graphite/epoxy unidirectional laminate in the direction along the fibers.

C Glass/epoxy unidirectional laminate in the direction along the fibers.

D Steel.

_____ 2. Which of the following will expand the most with temperature?

A Steel.

B Aluminum.

C Boron/Epoxy unidirectional lamina with 50% FVF in the direction perpendicular the fibers.

_____ 3. All of the following laminates will undergo bending from thermal loads EXCEPT

A [0/45/90/45/-45].

B [0/45/-45].

C [0/45/90/90/45/0].

D [0/30/-45].

_____ 4. Hygrothermal stresses and strains are caused by

A Changes in humidity and temperature.

B Mechanical loads.

C Water pressure.

D Air pressure.

_____ 5. If a hygrothermal load is the only load applied to a lamina, the overall mechanical load is equal to

A the same magnitude as the hygrothermal load.

B zero.

C slightly less than the hygrothermal load.

D the inverse of the hygrothermal load.

_____ 6. Hygrothermal forces are considered fictitious thermal forces because

A they act like mechanical forces, but no mechanical force is present.

B they are uncommon.

C they don't exist.

D they can only be produced in a laboratory.

_____ 7. Non-symmetric laminates undergo this when hygrothermal loads are applied

A Only in-plane extensional strains

B Warpage

C No warpage

_____ 8. To find the longitudinal linear coefficient of thermal expansion of a symmetric laminate using theoretical methods, one can apply a change in temperature of $\Delta T = 1$. What then is the measure of the longitudinal linear coefficient of thermal expansion of the laminate?

A The mid-plane curvature, $\kappa_x$

B The mid-plane strain, $\epsilon_x^o$

C The mid-plane curvature, $\kappa_y$

D The mid-plane strain, $\epsilon_y^0$