MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) Prior to the Industrial Revolution large openings in a masonry wall were spanned using:
   A) a lintel beam.  
   B) a steel truss.  
   C) an arch.  
   D) a header.

2) Natural stone is strong in
   A) bending.  
   B) shear.  
   C) compression.  
   D) tension.

MATCHING. Choose the item in column 2 that best matches each item in column 1.

Study the diagrams below. Match the structural member with the type of stress developed when the external force is applied.
3) Rafter A) compressive stress 3) _____
4) Ceiling joist B) Tensile stress 4) _____
5) Column C) Compressive stress 5) _____
6) Beam D) Bending stress 6) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

7) All building components will _______ when placed under load. 7) _____
   A) compress  B) twist  C) stretch  D) deform

8) Failure in a ductile material 8) _____
   A) occurs without warning.
   B) is sudden and catastrophic.
   C) is preceded by a large deformation, and generally provides advance warning.
   D) A & B above.

9) In the following stress–strain diagram of the materials X, Y and Z, which material has the highest 9) _____
   value of modulus of elasticity (E)?

A) X  B) Z  C) Y
10) A structurally efficient shape is one that
   A) can withstand a greater amount of load for the same amount of material.
   B) introduces redundancy in the structural system.
   C) requires a greater amount of material for the load applied than another material used in the
      same application.
   D) is more ductile.

11) Which of the following commonly used construction materials has the highest modulus of
    elasticity?
    A) Concrete  B) Steel  C) Masonry  D) Wood

TRUE/FALSE. Write 'T' if the statement is true and 'F' if the statement is false.

12) The intensity of internal resistance to an applied external force is called stress.  
    12) _____

13) Concrete is more ductile than steel.  
    13) _____

14) A steel bearing plate is used to decrease the bearing area of a column or beam.  
    14) _____

15) Failure by buckling or bending are essentially the same type of structural failures.  
    15) _____
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) The primary role of the building envelope is to
   A) support the building structure.
   B) accommodate doors and windows.
   C) separate the building interior from exterior forces.
   D) hide the building structure from view.

2) You have been hired to design a highly energy efficient building in a northern climate. You advise the client that it is most important to consider:
   A) the orientation of the building.
   B) the type of mechanical services.
   C) the design of the building envelope.
   D) the shape of the building.
   E) all the above.

3) To reduce heat transfer through a brick cavity wall, which mode(s) of heat transfer must be considered.
   A) Conduction
   B) Radiation
   C) Convection
   D) All the above

4) The following diagram is the graphic representation for

   A) blanket insulation
   B) batt insulation
   C) rigid board insulation
   D) concrete.
   E) all types of insulation

TRUE/FALSE. Write 'T' if the statement is true and 'F' if the statement is false.

5) The best way to ensure that a high R-value will be maintained in a wall assembly is to include a thermal bridge.
6) Expanded polystyrene (EPS) insulation has a closed cell structure.

7) R-value is a property of a component of a certain thickness.

8) High density materials make good insulators.
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) Factor(s) that directly affect air leakage in a building are the  
   A) area of envelope prone to leakage. 
   B) area (in SF) of the building footprint. 
   C) air pressure differential between inside and outside. 
   D) A & B. 
   E) A & C. 

2) Of the following assemblies/materials, which is most vapor permeable? 
   A) Plaster on metal lath 
   B) 15 lb asphalt felt 
   C) A concrete masonry wall (8 in thick) 
   D) Aluminum foil 

3) Which of the following construction types generally has the greatest air infiltration rate?  
   A) Concrete masonry 
   B) Wood light frame 
   C) Concrete 
   D) These construction types have essentially equal leakage rates. 

4) The best way to maintain good air quality in a tightly sealed building is to  
   A) leave a window open at all times. 
   B) provide operable windows. 
   C) use a system of controlled mechanical ventilation (air-to-air heat exchanger). 
   D) A & B. 

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

5) Use a dashed line on the diagram above to show the location of the vapor retarder in a conventional residential building in North America.
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) The phenomenon that kills the largest number building occupants in the US is 1) _____
   A) hurricanes.                       B) building fires.
   C) structural failures.              D) earthquakes.

2) Which factor(s) affect fire safety in buildings? 2) _____
   A) Public education
   B) Construction materials & systems
   C) Fire detection & suppression
   D) Architectural design
   E) All the above

3) Code regulations that ensure buildings remain fire-safe during their service life are contained in 3) _____
   the
   A) fire code.
   B) building code.
   C) zoning code.
   D) All the above.
   E) A & B.

4) Interior finish materials are tested and rated for 4) _____
   A) combustibility.
   B) smoke development.
   C) flame spread.
   D) all the above.
   E) B & C.

5) Class A interior finish materials are the 5) _____
   A) least hazardous in a fire.          B) most hazardous in a fire.