SWSA Lesson 3.1- Quality

MULTIPLE CHOICE

1. What is the rule of thumb used to determine minimum tower height and distance from nearby obstructions to the wind?
   a. Top of tower 30’ higher than obstructions within 500’
   b. Bottom of rotor 30’ higher than obstructions within 500’
   c. Top of tower 30’ higher than obstructions within 300’
   d. Bottom of rotor 30’ higher than obstructions within 300’

   ANS: B PTS: 1

2. What is the **minimum** acceptable tower height for a 12’ rotor with a 60’ obstacle height?
   a. 80’
   b. 100’
   c. 120’
   d. 140’

   ANS: B PTS: 1

3. With a site on a 100’ cliff and a high surface roughness, determine the maximum recommended setback from the cliff edge.
   a. 15’
   b. 25’
   c. 50’
   d. 250’

   ANS: B PTS: 1

4. With a site on a 100’ cliff and a low surface roughness, determine the maximum recommended setback from the cliff edge.
   a. 15’
   b. 25’
   c. 50’
   d. 250’

   ANS: D PTS: 1

5. When installing multiple small wind turbines at a site, what is the minimum recommended horizontal separation between turbines?
   a. 3-5 times the tower height
   b. 3-5 times the rotor diameter
   c. 10 times the tower height
   d. 10 times the rotor diameter.

   ANS: D PTS: 1

6. A ridge is defined as having a length to height ratio of
   a. 3:1
   b. 5:1
   c. 10:1
   d. 25:1

   ANS: C PTS: 1

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SHORT ANSWER

1. Explain the different approaches for siting small wind turbines versus commercial wind farms.

   ANS:
   Horizontal separation for wind farms
   Vertical separation for small wind turbines as horizontal is frequently not possible

   PTS: 1

2. What are the primary wind turbine siting methods used for minimizing turbulence.

   ANS:
   Keeping upwind of obstructions
   And/ or vertical separation from obstructions

   PTS: 1

3. What effect does ground clutter have on a wind turbine?

   ANS:
   Reduces wind speed and AEO.
   Increases turbulence and AEO.
   Increases equipment wear and tear.

   PTS: 1

4. Define turbulence and explain its effects using fluid analogies.

   ANS:
   Turbulence is caused by air flow over rough terrain, such as trees and buildings.
   Turbulent air eddies, swirls and reverses upstream, much like water in a river does when flowing over and around rocks, uneven river bottom, etc.

   PTS: 1

5. Identify several methods used for testing turbulence at a site.

   ANS:
   Balloon and tether with streamers
   Kite and streamers
   Professional turbulence study

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PTS: 1

6. Why is a wind rose important to a wind site assessor?

   ANS:
   Because it shows the prevailing wind directions, percent of energy and percent of time for 16 quadrants at a specific site. This information is critical to the proper siting of a wind turbine.

   PTS: 1

7. Where can the potential for the "venturi effect" be found?

   ANS:
   In valleys that run parallel to the prevailing wind direction and become narrow at the wind turbine site, there may exist the **potential** for the venturi effect..
   Beware of seasonal variations to the prevailing wind direction.

   PTS: 1

8. Differentiate between on shore and off shore wind and explain what causes them.

   ANS:
   On shore wind flows from the ocean onto land. The land warms quicker than the ocean in the morning, creating a thermal updraft, pulling the cooler ocean air onto the land.

   Off shore wind flows from the land toward the ocean. The land cools quicker than the ocean in the evening, so now the thermal updraft is over the ocean which pulls the cooler air from the land toward the ocean.

   PTS: 1

9. Differentiate between wind shear and turbulence intensity and explain how each affects the performance of a wind system.

   ANS:
   Wind shear (a) relates to the increase of wind speed with height- wind quantity.
   High wind shear means lower wind speed and decreased turbine AEO..

   Turbulence intensity (TI) relates to the gustiness of the site- wind quality.
   High TI lowers the wind energy and results in decreased turbine AEO

   PTS: 1

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10. Explain the effect that changing surface roughness has on a wind profile.

    ANS:
    A wind profile shows the amount of wind energy at a site according to height, represented by various lengths of vector lines. As surface roughness increases, the wind energy decreases and the vector lines shorten. As the height increases above the roughness (obstructions), the wind energy increases and the vector lines lengthen to reflect this.

    PTS: 1

11. Identify several procedures and tools for measuring obstacle height at a site.

    ANS:
    Girl scout / surveyor method
    Solar (broomstick) method
    Clinometer (with rangefinder)
    Photo with transit stick

    PTS: 1

12. Identify two methods of measuring obstacle height at a site and describe their use.

    ANS:
    Reference lesson 3.1 material

    PTS: 1

13. Name four requirements needed to achieve a good "wind window?"

    ANS:
    Upwind of obstacles
    30' above the mature tree height and other obstructions in the area
    Maximize distance from obstacles and neighbors
    Site is on location with highest elevation

    PTS: 1

ESSAY

1. Explain how wind flows over and around buildings, shelter belts, groves of trees and urban areas.

    ANS:
    Reference lesson 3.1 material

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PTS: 1

2. Identify local topographic factors that reduce or enhance the amount of wind energy available to a small wind installation.

   ANS:

   Reference lesson 3.1 material

   PTS: 1

3. Explain how wind flows over and around hills, bluffs and valleys.

   ANS:
   Reference lesson 3.1 material

   PTS: 1

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