SWSA Lesson 2- quantity

MULTIPLE CHOICE

1. If the wind speed is velocity, the power increases by
   a. 2X
   b. 4X
   c. 6X
   d. 8X

   ANS: D PTS: 1

2. What is the swept area of a 22 foot diameter rotor, expressed in square feet?
   a. 34.5
   b. 69
   c. 380
   d. 484

   ANS: C PTS: 1

3. What is laminar wind?
   a. Wind funneled by a valley
   b. Wind along a ridge top
   c. Wind speed strata
   d. Smooth wind

   ANS: D PTS: 1

4. Where can reliable wind speed data be found?
   a. Airport data
   b. Local weather station
   c. National weather service
   d. State wind maps

   ANS: D PTS: 1

5. What is the primary cause of wind?
   a. The Coriolis effect
   b. Weather systems
   c. Zonal wind patterns
   d. Heating from the sun

   ANS: D PTS: 1

COMPLETION

1. A 10% increase in wind velocity results in a _____ increase in power.

   ANS: 33%

   PTS: 1

2. The term “flagging” refers to

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ANS: Vegetative deformity caused by wind coming primarily from one direction

PTS: 1

SHORT ANSWER

1. Name three variables that affect wind density.

   ANS:
   Altitude (above sea level)
   Temperature
   Humidity

   PTS: 1

2. Describe the difference between climate and weather.

   ANS:
   Climate is long term and global in scope.
   Weather is short term, regional and affected by climate.

   PTS: 1

3. What is a wind profile?

   ANS:
   A wind profile is a graphical representation of the effect of ground drag that helps us "visualize" what is happening in moving air masses

   PTS: 1

4. What is a vector and what does it represent?

   ANS:
   A wind vector is a graphical illustration that shows what is happening inside of a wind profile. Vectors help us visualize fluid flow in a wind profile by using line lengths that vary according to the magnitude of the wind velocity.

   PTS: 1

5. How does ground drag affect wind velocity?

   ANS:

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Slows it down.
Rougher terrain = lower wind velocity

PTS: 1

6. What is wind shear?

ANS:
Wind velocity increasing with height.
(affected by surface friction)

PTS: 1

7. Define "alpha" and describe it's significance to wind velocity.

ANS:
An "alpha" is the surface friction coefficient used to mathematically describe wind shear at a given site based on surface roughness. The rougher the surface, the higher the apha numerical value.

PTS: 1

8. Explain the equation $P= {}^{1}/_{2}D \times A \times V^{3}$ and describe the importance of each variable.

ANS:
Power equals 1/2 of the air density (D), times the collector area (A), times the wind velocity cubed (V3).

D- air density decreases with altitude, thus affecting the power in the wind
A- is the collector or capture area which determines how much wind energy is captured
V3- means a small increase in V = a large increase in power

PTS: 1

9. List four wind speed map limitations:

ANS:
Possible answers:
1- Only takes into account predominant terrain, average ground cover
2- Does not account for local obstructions/ ground clutter
3- Deals only with averages, not seasonal variations (not specific enough for some applications)
4- Wind speed expressed as a range

PTS: 1

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10. Describe displacement height and explain it's importance for wind speed estimation.

    ANS:
    Displacement height is where the wind profile is displaced by groves of trees.
    It has a dramatic effect on the wind profile, which in turn has a dramatic effect on estimating the wind speed at a given height.

    PTS: 1

11. Identify the problems associated with using "near-ground" wind data, such as from airports or weather bureaus.

    ANS:
    Disappearing wind- anemometers out of calibration, worn bearings
    Anemometers sheltered by trees and buildings, improperly mounted
    Lack of standard data collection and reporting protocols

    PTS: 1

12. Describe the three points of information that a wind rose illustrates.

    ANS:
    1- Prevailing wind directions
    2- Percent of energy
    3- Percent of time

    PTS: 1

13. Identify four of the localized "wind problems" used for wind site assessment and describe their significance.

    ANS:
    Possible answers-

    Flagging, throwing,
    Presence of shelter belts, wind breaks, snow fences
    Shredded flags
    Power poles and other structures leaning away from the prevailing wind
    Other anecdotal info- "wind is annoying"

    PTS: 1

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