NCEES Fundamentals of Surveying (FS) Practice Exam (Sample)

Study Guide

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Questions

1. Define "GDOT" in terms of geodetic surveying.

A. Global Data Optimization Theory

B. Geodetic Depth of Tracking

C. Geodetic Data Ontology Transformation

D. Ground Data Observation Technology

2. In a transverse Mercator projection, the mapping angle varies with which of the following?

A. Longitude

B. Latitude

C. Latitude and longitude

D. None of the above

3. In which direction would a tract described as the southeast quarter of the northeast quarter of the southwest quarter lie relative to the southwest quarter of the northwest quarter of the same section?

A. North

B. East

C. South

D. West

4. Which tool is primarily used to measure angles in surveying?

A. Total station

B. Automatic level

C. Clinometer

D. Transit

5. A perpendicular bisector of a chord passes through the _____ of the circle.

A. radius

B. center

C. tangent

D. arc

6. Why is differential leveling important in surveying?

- **A. It determines the quality of soil**
- **B. It identifies topographic features**
- **C. It provides precise elevation differences between points**
- **D. It helps calculate land area**

7. What is the primary responsibility of a professional surveyor?

- **A. Client**
- **B. Employer**
- **C. Public welfare**
- **D. Surveying association**

8. The area of a square with one Gunter's chain on a side is most nearly?

- **A. 250 ft²**
- **B. 4400 ft²**
- **C. 10,000 ft²**
- **D. 44,000 ft²**

9. Which type of error is often predictable and can be compensated for during measurement?

- **A. blunder**
- **B. random error**
- **C. systematic error**
- **D. instrument error**

10. What does "apparent horizon" refer to in topographic surveying?

- **A. A theoretical line representing all geographic features**
- **B. A line that represents the visible boundary from a point of view**
- **C. A digital line plotted on surveying software**
- **D. The highest point of land visible from any point**

Answers

1. C
2. B
3. B
4. D
5. B
6. C
7. C
8. B
9. C
10. B

Explanations

1. Define "GDOT" in terms of geodetic surveying.

A. Global Data Optimization Theory

B. Geodetic Depth of Tracking

C. Geodetic Data Ontology Transformation

D. Ground Data Observation Technology

The correct answer focuses on "Geodetic Data Ontology Transformation," which refers to the systematic approach used in geodetic surveying to manage and relate geodetic data effectively. In the field of geodesy, which involves measuring and understanding the Earth's geometric shape, orientation in space, and gravitational field, data transformation is crucial for ensuring that various data sources can integrate seamlessly. The concept of ontology in this context refers to the structured framework that defines the relationships and categories of geospatial data. This is essential in geodetic surveying, as it allows practitioners to create a common understanding of the data used, ensuring that measurements from different sources and standards can be compared and utilized effectively. In contrast, the other options do not accurately capture the relevant concepts in geodetic surveying. For instance, global data optimization theory may imply methods to enhance the accuracy and efficiency of data processing but does not specifically relate to geodetic measurements or ontology. Similarly, the other choices reference various technological or theoretical ideas that do not align with the practices or definitions used in geodesy. Understanding the importance of data ontology transformation aids surveyors in making informed decisions about data integration and usage in geodetic applications.

2. In a transverse Mercator projection, the mapping angle varies with which of the following?

A. Longitude

B. Latitude

C. Latitude and longitude

D. None of the above

In a transverse Mercator projection, the mapping angle, also known as the angle of distortion, varies primarily with latitude. This projection is designed to minimize distortion along a central meridian, where the scale is true. As you move away from the central meridian towards higher latitudes, the projection increasingly distorts distances, areas, and angles. The transverse Mercator projection is particularly effective for regions that are elongated in the north-south direction, as it preserves angles over small areas but introduces distortions as one moves away from the central meridian. Therefore, while longitude plays a role in determining positioning along the projection, it is the latitude that fundamentally influences the variations in the mapping angle and associated distortions in the projection. Thus, the correct option indicates that the mapping angle varies specifically with latitude, reflecting the nature of distortion inherent in this type of projection.

3. In which direction would a tract described as the southeast quarter of the northeast quarter of the southwest quarter lie relative to the southwest quarter of the northwest quarter of the same section?

A. North

B. East

C. South

D. West

To determine the directional relationship between the two tracts described, it's essential to visualize the layout of the sections within a typical rectangular survey system, often referred to as the Public Land Survey System (PLSS). The southwest quarter of the northwest quarter refers to a specific portion of a section. Each section is divided into four quadrants, or quarters: northeast (NE), northwest (NW), southeast (SE), and southwest (SW). Within the section, when we look at the southwest quarter of the northwest quarter, we are identifying a smaller tract in the NW section of that section. Next, the southeast quarter of the northeast quarter of the southwest quarter indicates another subdivision within the southwest quarter of the northwest quarter. Here, we take the southwest quarter and identify its northeast quarter first. From that, we take the southeast quarter, which is further subdivided. To visualize this on a coordinate plane: 1. Start with your section and identify the northwest quarter, which is divided into two parts: the northeast quarter (NE) and the southwest quarter (SW). 2. Since we are focusing on the southeast quarter of the northeast quarter, it lies in the upper right section (NE). 3. The southwest quarter of the northwest quarter should be located directly to the

4. Which tool is primarily used to measure angles in surveying?

A. Total station

B. Automatic level

C. Clinometer

D. Transit

The primary tool used to measure angles in surveying is the transit. A transit is a precision instrument that allows surveyors to take horizontal and vertical angle measurements with high accuracy. It typically features a telescope that can rotate around a vertical axis, enabling the operator to sight distant objects for angle measurements. While a total station is also capable of measuring angles, it combines both angle measurement and distance measurement capabilities along with electronic data recording, making it more of an all-in-one device for modern surveying. However, when specifically focusing on the measurement of angles alone, the traditional transit is the more recognized tool historically. An automatic level is primarily used for leveling tasks rather than angle measurement, as it provides a horizontal line of sight for determining elevations. A clinometer is used to measure the angles of slope or inclination, commonly in contexts like forestry, geology, or construction, rather than traditional angle measurements in surveying. Thus, the transit stands out as the classic and specialized instrument most associated with measuring angles directly in surveying applications.

5. A perpendicular bisector of a chord passes through the _____ of the circle.

A. radius

B. center

C. tangent

D. arc

The perpendicular bisector of a chord in a circle has a unique geometric property: it always passes through the center of the circle. This relationship is rooted in the symmetry of circles and the definitions of chords, segments, and bisectors. When a chord is defined within a circle, it connects two points on the circumference. The perpendicular bisector of this chord is a line that not only divides the chord into two equal segments but also intersects it at a right angle. Due to the circle's symmetrical nature, this bisector aligns with the radius that also extends from the center of the circle to the midpoint of the chord. Consequently, any perpendicular drawn from the center of the circle to the chord will bisect the chord at a right angle. This principle underlines that for any given chord, its perpendicular bisector will invariably pass through the circle's center. Understanding this key relationship is crucial for tasks involving chord properties and circle geometry.

6. Why is differential leveling important in surveying?

A. It determines the quality of soil

B. It identifies topographic features

C. It provides precise elevation differences between points

D. It helps calculate land area

Differential leveling is a critical process in surveying because it provides precise elevation differences between points. This technique involves using a leveling instrument to measure the height of the instrument above a known benchmark and then taking readings at various points, allowing surveyors to determine the relative vertical positions of different locations accurately. Understanding elevation differences is essential in many surveying applications, such as construction projects, road design, and drainage planning. By knowing how much higher or lower one point is compared to another, surveyors can make informed decisions about grading, ensuring proper water flow, and maintaining building standards. It helps facilitate accurate designs, avoiding potential future issues related to elevation discrepancies. Other options may pertain to related aspects of surveying but do not directly relate to the fundamental purpose and pivotal importance of differential leveling, which is fundamentally about establishing accurate vertical relationships between points.

7. What is the primary responsibility of a professional surveyor?

A. Client

B. Employer

C. Public welfare

D. Surveying association

The primary responsibility of a professional surveyor is to ensure public welfare. This encompasses a broad range of duties, including providing accurate measurements and assessments that serve the safety and well-being of the community. Surveyors play a critical role in land development, construction, and environmental protection, which directly impacts the public. Their work is fundamental in establishing property boundaries and ensuring that developments comply with zoning laws and regulations that protect community interests. Furthermore, a professional surveyor must adhere to ethical standards and legal requirements that prioritize the health, safety, and welfare of the public. This moral obligation reflects the trust that society places in surveyors as professionals who are responsible for the integrity of land use and property rights. While the interests of clients, employers, and professional associations are important, they are secondary to the overarching duty that surveyors have to the public. This commitment ensures that the services provided are not only technically sound but also contribute positively to societal functioning and safety.

8. The area of a square with one Gunter's chain on a side is most nearly?

A. 250 ft²

B. 4400 ft²

C. 10,000 ft²

D. 44,000 ft²

To determine the area of a square with one Gunter's chain on each side, it is important to first understand the length of a Gunter's chain. A Gunter's chain, commonly used in surveying, is 66 feet in length. To find the area of a square, the formula used is: Area = side length × side length. In this case, if one side of the square is one Gunter's chain, then the length of each side is 66 feet. Therefore, the area can be calculated as follows: Area = 66 ft × 66 ft = 4356 ft². When rounded to the nearest whole number, this results in an area that is most nearly 4400 ft², given the options presented. This verifies that the total area of the square with one Gunter's chain on each side comes closest to 4400 ft². Understanding this concept demonstrates how critical it is to have a solid grasp of units and basic geometric principles when performing calculations related to surveying.

9. Which type of error is often predictable and can be compensated for during measurement?

A. blunder

B. random error

C. systematic error

D. instrument error

Systematic error refers to consistent, predictable inaccuracies that occur in measurements due to flaws in the measurement system, such as calibration issues, environmental factors, or inherent biases in the measurement process. These errors typically affect all measurements in the same way, which allows for them to be identified and compensated for effectively. For instance, if a survey instrument consistently reads a certain value higher or lower due to a calibration issue, the user can apply a correction factor to the measurements to ensure accuracy. This predictability is essential in the surveying field, as it enables surveyors to adjust their data to reflect true values more accurately. In contrast, other types of error like blunders are typically caused by human mistakes, are not predictable, and cannot be systematically compensated for. Random errors involve variations in measurements that occur due to unpredictable fluctuations, making them difficult to correct on a case-by-case basis. Instrument error can also arise from various issues, but it may not always be systematic; it can include both systematic and random components. Thus, systematic error is distinctly characterized by its predictability and the ability to apply corrective measures, emphasizing its importance in ensuring accurate and reliable surveying outcomes.

10. What does "apparent horizon" refer to in topographic surveying?

A. A theoretical line representing all geographic features

B. A line that represents the visible boundary from a point of view

C. A digital line plotted on surveying software

D. The highest point of land visible from any point

The term "apparent horizon" in topographic surveying refers to the line that represents the visible boundary from a specific point of view. This is the limit one can see in the landscape due to physical obstructions such as hills, trees, and buildings that block the line of sight. In other words, it's the boundary that defines what is visible in the environment relative to the observer's position. Understanding the apparent horizon is crucial for tasks such as determining sight lines for visibility analysis, understanding drainage patterns, or planning for construction where sightlines are an important consideration. The concept does not relate to a theoretical line of geographic features, which would involve a more abstract interpretation of the landscape. Similarly, it is not a digital representation created within surveying software, as that focus is on virtual modeling rather than the physical reality observed from a location. Lastly, while it may involve visible heights of land, the apparent horizon is not defined solely by the highest point visible but rather encompasses the overall visible limits as experienced from a vantage point. Thus, the correct understanding of the apparent horizon aligns with its definition as the visible boundary from which observations are made.