

**NSPS**

**SURVEY TECHNICIAN CERTIFICATION  
PROGRAM**

**LEVEL II  
SAMPLE EXAMINATION QUESTIONS**



**NATIONAL SOCIETY OF PROFESSIONAL SURVEYORS**

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March 2008

This booklet has been prepared to provide an example of what an actual Certified Survey Technician (CST) Examination might be like. Using this as your only study guide is not recommended.

This examination is 25% of an actual exam. The work element order is the same as in the full examination with approximately one quarter the number of questions.

These are not actual questions from past exams, but do reflect the complexity and makeup of actual exam questions.

Additional information about the CST program and exam availability can be obtained at:

- [www.nspsmo.org](http://www.nspsmo.org)
- (240) 632-9716 ext 112
- NSPS CST Program  
6 Montgomery Village Ave, Suite 403  
Gaithersburg, MD 20879

## WORK ELEMENTS

Test problems will be taken from the following work elements:

- 1) *Types of Surveys* (F=10; O=10)  
Knowledge of the principles of performing basic surveys: leveling, traversing, triangulation, trilateration, public land surveys, metes and bounds surveys, construction surveys, photo control surveys, and GPS surveys.
- 2) *Field Equipment & Instruments* (F=35; O=15)  
Knowledge of the care, cleaning, and use of a variety of surveying tools and equipment, including field radios. Knowledge of the operation, checking, and basic field adjustments on transits, theodolites, total stations, robotic total stations, data collectors, levels, compass, tribrachs, tripods, and GPS equipment. This would include repeating observations. Some historical knowledge is required.
- 3) *Survey Computations* (F=40; O=55)  
Knowledge of trigonometry, geometry, algebra, coordinate geometry, and basic surveying computations. A familiarity with hand-held calculators and micro-computers is important. With either a hand-held calculator or micro-computer software, be able to enter field data and produce positional information (i.e. leveling, traversing, stadia, topographic mapping and construction stakeout.) Demonstration of area, and intersection (bearing-bearing, distance-distance, bearing-distance) computations. Knowledge of the reduction and checking of field notes for determination of positions and elevations. Have an elementary comprehension of computer operating systems and GIS.
- 4) *Control Points: Horizontal & Vertical* (F=10; O=10)  
Know how to interpret control point records and data sheets, as well as locate points in the field.
- 5) *Field Operations* (F=35; O=10)  
Under the supervision of a party chief, be able to coordinate field work for a variety of standard types of surveys. Know how to observe the Sun and Polaris for True North determination. Know basic sources of measurement errors. Know principles of staking and stake markings. Know procedures for GPS surveys.
- 6) *Field Notes* (F=10; O=10)  
Know how to keep neat and orderly field notes for standard surveying operations: leveling, traversing, topographic mapping, layout, as-built surveys, boundary surveys, profile and cross-section surveys.
- 7) *Plan Reading & Preparation* (F=15; O=45)  
Knowledge and understanding of the basic plan reading and preparation (i.e. site plans, boundary plans, highway plans, profile and cross section, horizontal and vertical curves, pipeline plans, foundation plans, and developing existing and finishing contours). A basic knowledge of the terminology and principles of drafting, including computer-aided drafting (CAD).
- 8) *Principles of the Profession* (F=10; O=10)  
Knowledge of surveying ethics and technical standards. Show responsibility in the profession (i.e. attire, honesty, respect for personal property), awareness of related professional association.
- 9) *First Aid & Safety* (F=15; O=15)  
Basic knowledge of treatment practices for a variety of medical emergencies. Knowledge of traffic control and safety procedures for a variety of surveying and construction operations, including Occupational Safety and Health Administration (OSHA) standards.

## NSPS CST LEVEL II SAMPLE EXAMINATION

### Types Of Surveys

1. In a route survey, a station is:
  1. the headquarters for the project
  2. a point to set up the Total Station when performing the control traverse
  3. any point along a centerline measured from the point of the beginning
  4. a point located by resection methods
  
2. The standard dimensions of the SW  $\frac{1}{4}$  of the SW  $\frac{1}{4}$  of the SW  $\frac{1}{4}$  of a section are \_\_\_\_ feet by \_\_\_\_ feet.
  1. 2640, 2640
  2. 660, 660
  3. 1320, 2640
  4. 1320, 1320
  
3. To prolong a survey line in a direction ahead of your current set up the best results would be achieved by:
  1. doubling a  $180^\circ$  angle to your foresight point
  2. double centering a series of points to set the foresight
  3. turn angles at least four times
  4. use equal angle method

### Field Equipment & Instruments

4. A GPS Satellite has an approximate orbital time of:
  1. 2 days
  2. 6 hours
  3. 12 hours
  4. 24 hours

5. A “two-pole” chain is:
1. the length of a Gunter chain
  2. 33 feet long
  3. the basis of original survey of nearly all government lands
  4. 66 feet long
6. Which of the following tapes will lay out a distance longer than actual?
1. tape supported only at ends
  2. tape shorter than standard
  3. tension less than standard
  4. temperature 30° above standard
7. In a two-peg test of a level, the following observations were made:
- Instrument at mid-point between A and B reading on A = 6.35, reading on B = 4.78. Instrument at B reading on A = 4.57, reading on B = 2.90
- What is the true difference in elevation (in feet) between the two points?
1. 1.57
  2. 1.62
  3. 1.67
  4. 1.79
8. Which of the following is INCORRECT in reference to the setting up and using a surveyor’s instrument?
1. use light pressure when pushing tripod legs into the ground
  2. on a side hill location, two of the tripod legs should be on the downhill slope
  3. while making an observation, the body should not be in contact with the instrument
  4. the instrument operator should not tighten the adjusting and leveling screws as tight as possible.
9. When the bubble of a level is centered:
1. the axis of the level tube is perpendicular to the vertical axis
  2. the horizontal crosshairs lie in a plane perpendicular to the vertical axis
  3. the line of sight is perpendicular to the axis of the level tube
  4. the axis of the level is perpendicular to the horizontal axis

10. The reason most survey instruments go out of level is:

1. settlement of the tripod
2. kicking the tripod
3. putting a hand on the instrument
4. walking around the instrument

### Survey Computations

11. An NGS station whose coordinates are Y21786.09 and X23086.72 is to be occupied. The azimuth mark bears N 21° 10' 03" E. What clockwise angle must be turned to pass through a second station whose coordinates are Y22243.91 and X23948.00?

1. 25° 25' 18"
2. 40° 57' 14"
3. 40° 50' 21"
4. 48° 12' 39"

12. The backsight at a station is South 0° East. Projecting forward you turn the following deflection angles: 30° 30' right; 29° 21' 15" left; 46° 31' right. What is the forward bearing of your last reading?

1. S 12° 46' 15" W
2. N 44° 02' 45" E
3. N 47° 39' 45" E
4. S 76° 37' 45" E

13. Drawing file names have two parts: the name and the \_\_\_\_\_.

1. file type name
2. dwg
3. extension
4. filing

14. What is the ground area in acres if the scale of a map is  $1'' = 200'$  and the map area is equal to 13.351 square inches?
1. 12.26 acres
  2. 12.25 acres
  3. 12.65 acres
  4. 13.65 acres
15. If the magnetic azimuth (from north) of a line is  $135^\circ 30'$  in a location where the magnetic declination is  $12^\circ$  E, what is the true azimuth of the line?
1.  $S 44^\circ 30' E$
  2.  $56^\circ 30'$
  3.  $147^\circ 30'$
  4.  $123^\circ 30'$
16. A survey line has a bearing of  $S 21^\circ 46' 10'' E$ . How many degrees must be turned to go due east?
1.  $21^\circ 46' 10'$  clockwise
  2.  $21^\circ 46' 10''$  counter clockwise
  3.  $68^\circ 13' 50''$  clockwise
  4.  $68^\circ 13' 50''$  counter clockwise
17. Four wooden piles in line and 15 ft apart are to be driven so the cutoff elevation of each pile is progressively lower than the preceding pile by  $1\frac{7}{8}$  inches. If the instrument elevation is 4320.02 and the rod reading on the first pile is 3.78, what is the elevation of the last pile cutoff?
1. 4315.08
  2. 4315.57
  3. 4315.77
  4. 4316.20

18. A traverse having a total length of 71,392.06 feet failed to close by 0.37 feet in northing and 0.53 feet in Easting. What is the relative accuracy of this traverse to the nearest 100 feet?
1. 1:11,500
  2. 1:110,500
  3. 1:100,000
  4. 1:10,000
19. Taping a distance of 967.82 feet was measured with a 100 foot steel tape that was 0.03 of a foot too long. What is the true distance measured (in feet)?
1. 967.53
  2. 968.11
  3. 967.84
  4. 968.53

#### **Control Points – Horizontal & Vertical**

20. In the United States a reference datum for leveling is the:
1. MSL Datum of 1929
  2. MSL Datum of 1927
  3. MSL Datum of 1986 adjusted
  4. MSL Datum of 1983
21. In topographic surveying the control for elevations is called:
1. positional
  2. horizontal
  3. vertical
  4. topographic
22. On a construction site, vertical benchmarks should be checked:
1. each time used by closing the level circuit back on to it
  2. checked each time used if it looks disturbed
  3. check each time used with at least one other known point
  4. every 100 – 200 feet

## Field Operations

23. At a corner, the deed calls for a pine tree. In close proximity you find a concrete monument, an iron pipe and an oak stump with a blaze on it. What should you locate and record in the data collector?
1. only the concrete monument is likely correct
  2. only the iron pipe as it matches the call distance
  3. only the oak tree as the original surveyor may not have identified the tree
  4. everything as a registered professional will need to evaluate each item
24. In running a traverse line you are asked to set the next turning point, of the following which would be the most desirable location to set the point?
1. at a known location so you can find it later
  2. on the crest of a small hill with good visibility both ways
  3. at a point when the instruments operator will be in the shade
  4. in a low gully so that readings are progressively higher and higher
25. When running a curve by deflections from any station on the curve, to facilitate turning to the next station you can backsight the previous station with:
1. the deflection angle for the previous station sighted on the circle
  2. the deflection angle for the next station to be sighted on the circle
  3.  $0^\circ$  set on the circle
  4.  $180^\circ$  set on a circle
26. A 2-minute error in reading an angle means that a point that is set 50 feet away is off by:
1. 0.29
  2. 0.30
  3. 0.03
  4. 0.003
27. Which of the following is a mistake and not an error?
1. discrepancy in angle read on an instrument that is out of adjustment
  2. instrument set up on the wrong hub
  3. discrepancy in rod reading due to parallax
  4. slightly misreading the vernier

28. In measuring a zenith angle with a total station the following readings were observed:

$$1D = 91^\circ 14' 26''$$

$$2D = 91^\circ 14' 25''$$

$$1R = 268^\circ 45' 28''$$

$$2R = 268^\circ 45' 31''$$

What is the best value for the zenith angle?

1.  $91^\circ 14' 26''$
  2.  $91^\circ 14' 27''$
  3.  $91^\circ 14' 28''$
  4.  $91^\circ 14' 29''$
29. To set a grade for a sewer line at station 13+50 (invert = 663.80) a level is set up and reads 5.03 on a benchmark (elevation of 672.55). What reading on a level Rod must be made to mark. Cut 12' (feet) on the grade stake?

1. 1.78
2. 2.93
3. 5.03
4. 3.85

30. In measuring a horizontal angle with a total station the following readings were observed:

$$D = 0^\circ 00' 00''$$

$$R = 180^\circ 00' 03''$$

$$R = 200^\circ 01' 07''$$

$$D = 20^\circ 01' 02''$$

What is the mean horizontal angle of the above set?

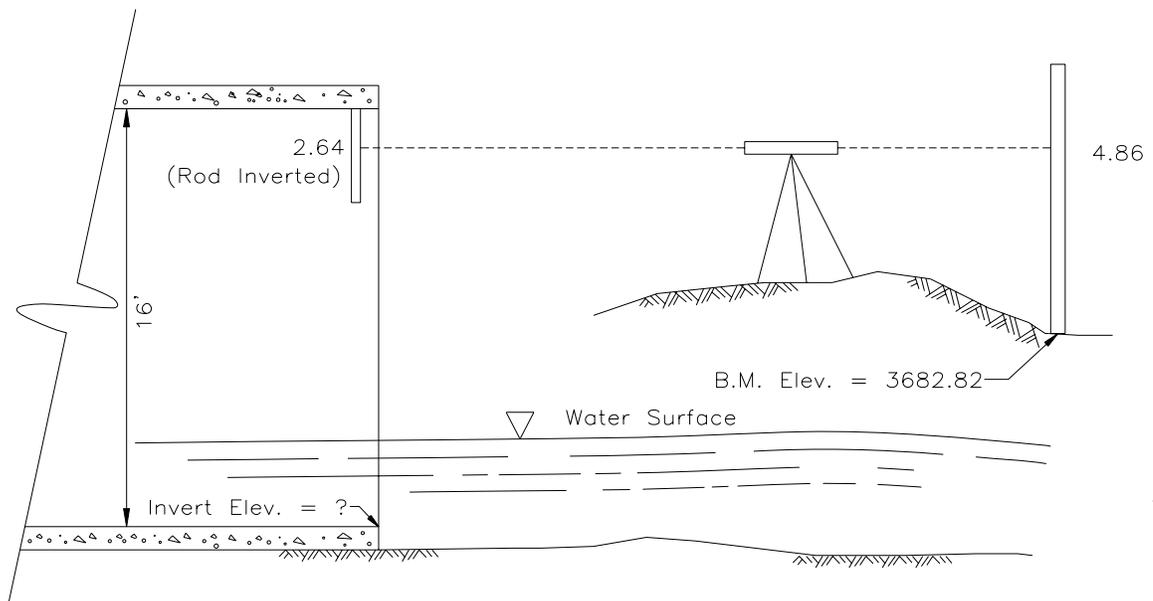
1.  $20^\circ 01' 03''$
2.  $100^\circ 00' 33''$
3.  $180^\circ 00' 04''$
4.  $200^\circ 01' 06''$

## Field Notes

31. See Figure 220. It is necessary to determine the invert elevation of a large concrete culvert with an inside height of 16 ft. A direct reading on the floor elevation cannot be made due to the water flowing through the structure. By setting up on the bank of the channel and having the rodperson lean over from the top of the structure with a 6-foot rod they were able to take a reading on the ceiling of the structure with the rod inverted. Using the readings shown in the figure, what is the elevation of the ceiling of the box?

1. 3687.68
2. 3690.32
3. 3674.32
4. 3677.04

FIGURE 0220



32. A differential level traverse was run from BM #1 to BM #2 and closed with zero error. The sum of the backsights when totaled was less than the sum of the foresights. This indicates that the:
1. elevation of BM #2 is lower than BM #1
  2. elevation of BM #2 is higher than BM #1
  3. rod was read incorrectly
  4. one of the BMs is wrong

33. A field crew equipped with a hand level and range pole are to determine the rough elevation of an exploratory boring relative to a manhole rim (assumed elevation = 100 feet). The following summarizes their field notes:

Backsight on manhole is 4.5 feet  
Foresight to turning point is 8.3 feet  
Backsight to turning point 1 is 1.1 foot  
Foresight to boring is 10.3 feet

The elevation of the boring is \_\_\_\_\_ feet.

1. 78
2. 87
3. 100
4. 114

### **Plan Reading & Preparation**

34. A polar planimeter is used to:

1. determine contours on a map
2. calculate area by tracing on the boundary of an area
3. measure distances on a map
4. measure field distances

35. A detailed diagram of a roadway construction materials at 90° to the centerline is called a:

1. ground cross section
2. plan
3. profile
4. typical cross section

36. On a USGS 7 ½ minute quad map one of the coordinate systems shown are:

1. Clark Ellipsoid Coordinates
2. Earth-Centered X, Y, Z Coordinates
3. Lambert Conformal Coordinates
4. Universal Traverse Mercator Coordinates

37. On a map at a scale of 1"=2000' and a contour interval of 20', what is the % of slope of a railroad on the map which scales 2.67 inches between four contour lines?
1. 3.0
  2. 1.5
  3. 2.7
  4. 1.1
38. To fit a scale of 1:10,000 on a 8 1/2 by 11 inch sheet of paper with a 1" border. What is the largest area, in acres, that can be shown?
1. 9.32
  2. 932
  3. 93.2
  4. 9,320

### **Principles of the Profession**

39. What does the term "G.I.S." refer to in land surveying?
1. Geographic Information Systems
  2. Geodetic Interpretation Systems
  3. Global Information Systems
  4. Geographic International Survey
40. Actions that relate to the public, clients and other surveyors would describe:
1. surveying ethics
  2. survey standards on how a survey is to be performed
  3. laws relating to licensure or registration
  4. penalties for improper practice
41. Whether private survey control data is included in the national system is determined by which of the following agencies or groups?
1. Bureau of Land Management
  2. National Geodetic Survey
  3. National Geological Survey
  4. United States Geologic Survey

## **First Aid and Safety**

42. Always treat injuries in the order of their importance. Which is the first problem you should treat?
1. bleeding
  2. stoppage of breathing
  3. burns
  4. heat stroke
43. According to OSHA, what is the responsibility of the employer as far as first aid is concerned?
1. an employee must have a valid certificate in first aid training
  2. notices concerning health and safety shall be posted
  3. the employer shall provide proper first aid equipment and training
  4. these are the employees' responsibilities
44. When dealing with first aid what should be conspicuously posted in the field survey vehicle?
1. latest list of survey firms in the area worked by the survey crew
  2. telephone numbers of physicians, hospitals, and ambulances in the area worked by the survey crew
  3. C.B. handles of all C.B. radio operators in the area worked by the survey crew
  4. telephone numbers of all survey crews working in the area
45. First aid for a severe laceration of the forearm should be to:
1. apply an approved tourniquet at the nearest pressure point and transport to the nearest doctor, watch for signs of shock
  2. close the wound and quickly tape shut, cover with gauze bandages and get patient to nearest doctor, watching for signs of shock
  3. cause the victim to lie down and remain still holding affected part vertical with gauze bandages wrapped around it and call for ambulance
  4. apply direct pressure and transport victim to medical attention immediately, watch for signs of shock

## **Answer Key**

### **Types of Surveys**

Q #1 Ans. 3

Q #2 Ans. 2

Q #3 Ans. 2

### **Field Equipment & Instruction**

Q #4 Ans. 3

Q #5 Ans. 2

Q #6 Ans. 4

Q #7 Ans. 1

Q #8 Ans. 1

Q #9 Ans. 1

Q #10 Ans. 1

### **Survey Computations**

Q #11 Ans. 3

Q #12 Ans. 3

Q #13 Ans. 3

Q #14 Ans. 1

Q #15 Ans. 3

Q #16 Ans. 4

Q #17 Ans. 3

Q #18 Ans. 2

Q #19 Ans. 2

### **Control Points – Horizontal & Vertical**

Q #20 Ans. 1

Q #21 Ans. 3

Q #22 Ans. 3

### **Field Operations**

Q #23 Ans. 4

Q #24 Ans. 2

Q #25 Ans. 1

Q #26 Ans. 3

Q #27 Ans. 2

Q #28 Ans. 3

Q #29 Ans. 1  
Q #30 Ans. 1

**Field Notes**

Q #31 Ans. 2  
Q #32 Ans. 1  
Q #33 Ans. 2

**Plan Reading & Preparation**

Q #34 Ans. 2  
Q #35 Ans. 4  
Q #36 Ans. 4  
Q #37 Ans. 4  
Q #38 Ans. 2

**Principles of the Profession**

Q #39 Ans. 1  
Q #40 Ans. 2  
Q #41 Ans. 2

**First Aid and Safety**

Q #42 Ans. 2  
Q #43 Ans. 3  
Q #44 Ans. 2  
Q #45 Ans. 4