Unit 10 - Week 8:Photogrammetry & LiDAR (LiDARgrammetry)

Course outline

How does an NPTEL online course work?

Week 0: Prerequisite

Week 1: Introduction to Higher Surveying and Coordinate System & Reference Frame

Week 2: Coordinate System and Reference Frame & Time and Astronomy

Week 3: Time and Astronomy & Error, Accuracy, and Adjustments Computations

Week 4: Error, Accuracy, and Adjustments Computations

Week 5: Error, Accuracy, and Adjustments Computations, GPS & Photogrammetry

Week 6: Photogrammetry

Week 7:Photogrammetry

Week 8:Photogrammetry & LiDAR (LiDARgrammetry)

○ Quiz : Assignment 8

● Lec 1:Close range photogrammetry

● Lec 2:Fundamentals of LiDAR

○ Lec 3:LiDAR data acquisition

○ Weekly feedback form for week 8

Week 9: RADAR (RADARgrammetry)

Week 10: RADAR (RADARgrammetry)

Week 11: RADAR (RADARgrammetry) & Hydrographic Survey

Week 12: Hydrographic Survey & Navigation

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Assignment 8

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-03-25, 23:59 IST.

1) If we are surveying any area using photogrammetry, what are the stepwise process, we do? (in general manually) ***1 point***

○ a. Camera Calibration, Space Intersection, Space Resection, Orthophoto generation
○ b. Space Intersection, Camera Calibration, Space Resection, Orthophoto generation
○ c. Camera Calibration, Space Resection, Space Intersection, Orthophoto generation.
○ d. Camera Calibration, Space Intersection, Orthophoto generation and Space Resection.

No, the answer is incorrect.
Score: 0
Accepted Answers:
c. Camera Calibration, Space Resection, Space Intersection, Orthophoto generation.

2) Direct Linear Transformation is which type of transformation? ***1 point***

○ a. Projective
○ b. Conformal
○ c. Affine
○ d. Ratio of two first order polynomial

No, the answer is incorrect.
Score: 0
Accepted Answers:
d. Ratio of two first order polynomial

3) How can we express the Direct Linear Transformation in homogeneous coordinates? (Assume (x,y,w) are the image and (X,Y,Z,W) are the object or world homogeneous coordinates. (rest of the notations are as told in the video lecture) ***1 point***

○ a. $\begin{bmatrix} x \\ y \\ w \end{bmatrix} = \begin{bmatrix} L_1 & L_2 & L_3 & L_4 \\ L_5 & L_6 & L_7 & L_8 \\ L_9 & L_{10} & L_{11} & 1 \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \\ W \end{bmatrix}$

○ b. $\begin{bmatrix} X \\ Y \\ Z \\ W \end{bmatrix} = \begin{bmatrix} L_1 & L_2 & L_3 & L_4 \\ L_5 & L_6 & L_7 & L_8 \\ L_9 & L_{10} & L_{11} & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ w \end{bmatrix}$

○ c. $\begin{bmatrix} x \\ y \\ w \end{bmatrix} = \begin{bmatrix} L_1 & L_4 & L_7 & L_{10} \\ L_2 & L_5 & L_8 & L_{11} \\ L_3 & L_6 & L_9 & 1 \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \\ W \end{bmatrix}$

○ d. $\begin{bmatrix} X \\ Y \\ Z \\ W \end{bmatrix} = \begin{bmatrix} L_1 & L_4 & L_7 & L_{10} \\ L_2 & L_5 & L_8 & L_{11} \\ L_3 & L_6 & L_9 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ w \end{bmatrix}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
a. $\begin{bmatrix} x \\ y \\ w \end{bmatrix} = \begin{bmatrix} L_1 & L_2 & L_3 & L_4 \\ L_5 & L_6 & L_7 & L_8 \\ L_9 & L_{10} & L_{11} & 1 \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \\ W \end{bmatrix}$

4) In Zhang's method of camera calibration, to determine the homography between the planes using a matrix h, how many minimum number of points are required for determining h from an image? ***1 point***

○ a. 3
○ b. 4
○ c. 8
○ d. 6

No, the answer is incorrect.
Score: 0
Accepted Answers:
c. 8

5) For a 8 MP digital camera (sensor size 4.8 mm×3.6 mm), Zhang's method gives focal length value of 4.21 mm, find the focal length in pixels. ***1 point***

○ a. 2865
○ b. 2866
○ c. 2867
○ d. 2868

No, the answer is incorrect.
Score: 0

Accepted Answers:
a. 2865

6) In the Zhang's method, how do we calculate r_1, r_2, r_3 (rotation matrix) when h and K are known? (assume same notations as in the video lecture) ***1 point***

○ a. $r_1 = K^{-1}h_1, r_2 = K^{-1}h_2, r_3 = 0, t = K^{-1}h_3$

○ b. $r_1 = K^{-1}h_1, r_2 = K^{-1}h_2, r_3 = r_1 r_2, t = K^{-1}h_3$

○ c. $r_1 = K^{-1}h_3, r_2 = K^{-1}h_1, r_3 = K^{-1}h_2, t = \frac{r_1^2}{r_2}$

○ d. $r_1 = K^{-1}h_3, r_2 = K^{-1}h_1, r_3 = K^{-1}h_2, t = r_1 r_2$

No, the answer is incorrect.
Score: 0

Accepted Answers:
b. $r_1 = K^{-1}h_1, r_2 = K^{-1}h_2, r_3 = r_1 r_2, t = K^{-1}h_3$

7) How many minimum number of points are required for Direct Linear Transformation and Zhang's method of camera calibration? ***1 point***

○ a. 12, 12
○ b. 6, 4
○ c. 6, 12
○ d. 4, 12

No, the answer is incorrect.
Score: 0

Accepted Answers:
c. 6, 12

8) Consider the following and choose the correct option: Statement 1: It is recommended that for close range applications whatever the distance between camera and object is used for camera calibration, similar or same distance should be used because the camera parameters may change for different distances. Statement 2: Non-metric cameras are always consumer grade cameras that are available for photography, because for those cameras interior orientation parameters are not made available by manufacturer. ***1 point***

○ a. Statement 1 is true and statement 2 is false
○ b. Both statement 1 and statement 2 are true
○ c. Statement 1 is false and statement 2 is true
○ d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0

Accepted Answers:
a. Statement 1 is true and statement 2 is false

9) Consider the following and choose the correct option: Statement 1: Direct linear transformation (DLT) is obtained by converting nonlinear collinear equation to linear coefficient equations of ratio of two planes. Statement 2: The parameters of DLT are nonlinear parameters, though they are giving linear form of collinearity equation. ***1 point***

○ a. Statement 1 is true and statement 2 is false
○ b. Both statement 1 and statement 2 are true
○ c. Statement 1 is false and statement 2 is true
○ d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0

Accepted Answers:
b. Both statement 1 and statement 2 are true

10) Consider the following and choose the correct option: Statement 1: In DLT, object reference frame (ground reference frame) can be arbitrary or may be adapted from existing one but it should be same for all images in a project. Statement 2: In DLT, one cannot select the larger distance such that the ratio of thickness or depth of an object to the distance between camera and object becomes negligible. ***1 point***

○ a. Statement 1 is true and statement 2 is false
○ b. Both statement 1 and statement 2 are true
○ c. Statement 1 is false and statement 2 is true
○ d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0

Accepted Answers:
a. Statement 1 is true and statement 2 is false

11) Consider the following and choose the correct option: Statement 1: DLT equations when solved by least square method to determine all 11 parameters for an image for the given redundant data, have elements in matrix that are multiplication of image coordinate and object coordinate. Statement 2: Though DLT is derived from collinearity equations, DLT is slightly different because it considers object coordinates (X,Y,Z) as dependent coordinates which are expressed in terms of image coordinates (x,y,z). ***1 point***

○ a. Statement 1 is true and statement 2 is false
○ b. Both statement 1 and statement 2 are true
○ c. Statement 1 is false and statement 2 is true
○ d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0

Accepted Answers:
a. Statement 1 is true and statement 2 is false

12) Consider the following and choose the correct option: Statement 1: DLT provides the estimate of rotations (ω,ϕ,κ) between image reference frame and object reference frame directly by nonlinear processes of calculation. Statement 2: One can estimate camera position coordinates or coordinates of perspective center of camera using 11 parameters of DLT equations directly but one needs to first estimate the focal length and principle point coordinates (f,x,y) in order to find position of perspective centers (X_0, Y_0, Z_0). ***1 point***

○ a. Statement 1 is true and statement 2 is false

○ b. Both statement 1 and statement 2 are true
○ c. Statement 1 is false and statement 2 is true
○ d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0

Accepted Answers:
d. Both statement 1 and statement 2 are false

13) Consider the following and choose the correct option: Statement 1: In DLT, the inferior quality of DLT parameters (high covariance-variance matrix values) will certainly give better quality of position of perspective center/ or camera, because camera positions are obtained by taking inverse of a matrix that consists of most of DLT parameters. Statement 2: In DLT method, quality covariance- variance of rotations (ω,ϕ,κ) between image reference frame and object reference frame depend upon the quality of focal length. However, quality of focal lengths cannot influence the quality of camera position. ***1 point***

○ a. Statement 1 is true and statement 2 is false
○ b. Both statement 1 and statement 2 are true
○ c. Statement 1 is false and statement 2 is true
○ d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0

Accepted Answers:
c. Statement 1 is false and statement 2 is true

14) Consider the following and choose the correct option: Statement 1: In Zhang's method, it is a must condition that all points should lie in one plane (XY) so that the third dimension (height or depth) will automatically be zero. This reduces the number of unknowns in Zhang's method, which is based on collinearity equation. Statement 2: In Zhang's method, interior orientation parameters are included in a matrix that considers scale in one direction. This is contradiction to the DLT, which considers scale in both directions. ***1 point***

○ a. Statement 1 is true and statement 2 is false
○ b. Both statement 1 and statement 2 are true
○ c. Statement 1 is false and statement 2 is true
○ d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0

Accepted Answers:
a. Statement 1 is true and statement 2 is false

15) Consider the following and choose the correct option: Statement 1: In practical implementation in Zhang's method, the checkerboard should have rectangular box of known dimensions with odd number boxes on board. Statement 2: Checkerboard should be placed on objects in different locations around the object so that all possible variations of object surface can be covered. ***1 point***

○ a. Statement 1 is true and statement 2 is false
○ b. Both statement 1 and statement 2 are true
○ c. Statement 1 is false and statement 2 is true
○ d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0

Accepted Answers:
d. Both statement 1 and statement 2 are false

16) Consider the following and choose the correct option: Statement 1: The surface from motion (SfM) algorithm or procedure assumes that camera and object are relatively moving so multiple overlapping views are captured for an object and using collinearity equation, we find the 3D views from redundant data. Statement 2: In SfM algorithm, the distance in different views of an object acquired from a camera, horizontal distance between camera and object and overlap of minimum 80% and should be maintained. ***1 point***

○ a. Statement 1 is true and statement 2 is false
○ b. Both statement 1 and statement 2 are true
○ c. Statement 1 is false and statement 2 is true
○ d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0

Accepted Answers:
a. Statement 1 is true and statement 2 is false

17) Consider the following and choose the correct option: Statement 1: SfM process of 3D model development should be performed after camera calibration using Zhang's method, because Zhang's method provides desired and appropriate parameters' estimates for SfM method. Statement 2: SfM is an example of convergent photography where all photos may converge at a point on a small area, so it cannot use the collinearity equation, which is generally, used for the stereo photogrammetry. ***1 point***

○ a. Statement 1 is true and statement 2 is false
○ b. Both statement 1 and statement 2 are true
○ c. Statement 1 is false and statement 2 is true
○ d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0

Accepted Answers:
a. Statement 1 is true and statement 2 is false

18) Consider following two statements: Statement 1: Laser is a light in visible range of electromagnetic spectrum only. Statement 2: Laser cannot be generated in X-ray region of electromagnetic region. ***1 point***

○ a. Statement 1 is true and statement 2 is false
○ b. Both statement 1 and statement 2 are true
○ c. Statement 1 is false and statement 2 is true
○ d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0

Accepted Answers:
d. Both statement 1 and statement 2 are false

19) Consider the following statements: Statement 1: Continuous laser wave does not diverge with distance whereas laser pulse diverges and creates laser spots on surface. Statement 2: Beam diverge creates ambiguity in positioning within a laser footprint, when laser pulse interacts with a plane surface. However, while interacting with tree canopy, beam divergence of laser pulse does not create ambiguity but creates multiple returns. ***1 point***

○ a. Statement 1 is true and statement 2 is false
○ b. Both statement 1 and statement 2 are true
○ c. Statement 1 is false and statement 2 is true
○ d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0

Accepted Answers:
d. Both statement 1 and statement 2 are false

20) Consider the following statements: Statement 1: A laser pulse having higher power will have smaller footprint and will be more accurate for planimetric position. Statement 2: A laser pulse having higher power will travel fast in air and so, high power pulse are employed in laser scanner for conducting 3D survey in minimum time. ***1 point***

○ a. Statement 1 is true and statement 2 is false
○ b. Both statement 1 and statement 2 are true
○ c. Statement 1 is false and statement 2 is true
○ d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0

Accepted Answers:
d. Both statement 1 and statement 2 are false

21) Consider the following two statements about two laser pulses having different pulse length but having same average power. Statement 1: Laser pulse of smaller pulse length will have more number of photons. Statement 2: A laser pulse of having higher value of pulse length will travel slower but to large distance than a pulse having smaller pulse length. ***1 point***

○ a. Statement 1 is true and statement 2 is false
○ b. Both statement 1 and statement 2 are true
○ c. Statement 1 is false and statement 2 is true
○ d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0

Accepted Answers:
d. Both statement 1 and statement 2 are false

22) A laser pulse has a pulse length of 10 ns. If 10^6 such pulses are generated in one second with an average power of 2 W, calculate the peak power of a transmitted pulse. ***1 point***

○ a. 0.1 KW
○ b. 0.2 KW
○ c. 0.3 KW
○ d. 0.4 KW

No, the answer is incorrect.
Score: 0

Accepted Answers:
b. 0.2 KW

23) Consider the following two statements: Statement 1: A laser is monochromatic light, it travels for long distance. Statement 2: If a laser has photons of different wavelength it will change its colour while travelling. ***1 point***

○ a. Statement 1 is true and statement 2 is false
○ b. Both statement 1 and statement 2 are true
○ c. Statement 1 is false and statement 2 is true
○ d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0

Accepted Answers:
a. Statement 1 is true and statement 2 is false

24) Calculate area of illumination (foot print) on ground at a distance of 1000 m from a transmitter having opening of 3 mm, firing laser pulses of 0.2 mrad beam divergence. What percentage (%) increase one should expect in foot print size due to transmitter opening? ***1 point***

○ a. 0.20
○ b. 0.60
○ c. 0.30
○ d. 0.40

No, the answer is incorrect.
Score: 0

Accepted Answers:
c. 0.30

25) Calculate peak power of reflected pulse, it atmospheric absorption coefficient is 0.72 and reflective index of surface is 0.9. Peak Power of triggered pulse is 200 W, divergence is 0.3 mrad, and distance between target and object surface is 700 m. Object is of circular size of diameter 0.5 m. ***1 point***

○ a. 7946.94 watt
○ b. 7646.94 watt
○ c. 7346.94 watt
○ d. 7046.94 watt

No, the answer is incorrect.
Score: 0

Accepted Answers:
c. 7346.94 watt

26) Calculate size of foot print at $(1/e^2)$ level for a laser pulse of 1000 nm travelling to a distance of 1200 m. Beam divergence 0.1 mrad from a transmitter of 6mm opening. ***1 point***

○

a. $0.1m^2$

○

b. $0.2m^2$

○

c.$0.3m^2$

○

d. $0.4m^2$

No, the answer is incorrect.
Score: 0

Accepted Answers:
a. $0.1m^2$

27) Consider following two statements: Statement 1: Due to normal shape of pulse over a foot print, objects which are locates at center of foot print having higher probability of getting detected than object located off the center. Statement 2: Due to normal shape of laser pulse objects (even having higher reflectivity but small areas) located off the center in a foot print will reflect lower power than the object (having lower reflectivity and larger area) at center of foot print. ***1 point***

○ a. Statement 1 is true and statement 2 is false
○ b. Both statement 1 and statement 2 are true
○ c. Statement 1 is false and statement 2 is true
○ d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0

Accepted Answers:
b. Both statement 1 and statement 2 are true

28) Consider the following two statements about LiDAR platforms: Statement 1: In airborne LiDAR data acquisition, LiDAR sensor is mounted with other sensors, namely GPS and Inertial Measurement Unit (IMU). Statement 2: Simultaneous data acquisition for airborne LiDAR generally means acquiring data Simultaneously with LiDAR sensor, IMU and GPS. ***1 point***

○ a. Statement 1 is true and statement 2 is false
○ b. Both statement 1 and statement 2 are true
○ c. Statement 1 is false and statement 2 is true
○ d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0

Accepted Answers:
a. Statement 1 is true and statement 2 is false

For an ideal case, where atmosphere behaves like a vacuum for a pulse of 2000 W peak power. If a laser pulse is fired at 10° from vertical, two returns respectively from top of tree and ground surfaces are received. If flying height of airborne LiDAR sensor is 300 m and height of tree is 10 m, answer following questions (from 29 to 37):

29) Calculate time of flights for first and second returns. ***1 point***

○ a. Statement 1 is true and statement 2 is false
○ b. Both statement 1 and statement 2 are true
○ c. Statement 1 is false and statement 2 is true
○ d. Both statement 1 and statement 2 are false

No, the answer is incorrect.
Score: 0

Accepted Answers:
a. Statement 1 is true and statement 2 is false

30) Calculate the length that laser pulse travel from tree top to ground surface. ***1 point***

○ a. 12.15 m
○ b. 11.15 m
○ c. 10.15 m
○ d. 13.15 m

No, the answer is incorrect.
Score: 0

Accepted Answers:
c. 10.15 m

31) What is horizontal distance between 2 points where laser pulse interacted (tree top and ground) ***1 point***

○ a. 2.76 m
○ b. 1.76 m
○ c. 2.26 m
○ d. 1.26 m

No, the answer is incorrect.
Score: 0

Accepted Answers:
b. 1.76 m

32) If peak power of transmitted pulse is 2000 W, and three responses are generated as returned pulse with following power values which two values corresponds to building top and ground surface: 950 W,1050 W,12220 W. ***1 point***

○ a. 950 W corresponds to tree top and 12220 W corresponds to ground surface
○ b. 12220 W corresponds to building top and 950 W corresponds to ground surface
○ c. 1050 W both corresponds to building top and the ground surface
○ d. 1050 W corresponds to building top and 1220 W corresponds to ground surface

No, the answer is incorrect.
Score: 0

Accepted Answers:
d. 1050 W corresponds to building top and 1220 W corresponds to ground surface

33) If receiver has 5 mm opening, what should be value of solid angle in which reflected pulse will interact with receiver. ***1 point***

○ a. 8.62
○ b. 7.62
○ c. 6.72
○ d. 5.72

No, the answer is incorrect.
Score: 0
Accepted Answers:
b. 7.62

34) If efficiency of laser generation is 30%. What is input average power required if pulse width is 10 ns. ***1 point***

○
a. $6.66 \times 10^{-}6$
○
b. $7.66 \times 10^{-}6$
○
c. $8.66 \times 10^{-}6$
○
d. $9.66 \times 10^{-}6$

No, the answer is incorrect.
Score: 0
Accepted Answers:
a. $6.66 \times 10^{-}6$

35) Suppose longitudinal profile of is modelled by symmetric laser pulse a triangular distribution (instead of normal distribution) where vertex of triangle indicates peak power. Calculate FWHM if rise time is (1/10) of total pulse width (t). ***1 point***

○ a. 1/8 t
○ b. 5/8 t
○ c. 7/8 t
○ d. 9/8 t

No, the answer is incorrect.
Score: 0
Accepted Answers:
c. 7/8 t

36) Calculate the pulse width at $1/e^2$ level. ***1 point***

○ a. 0.04 radian
○ b. 0.03 radian
○ c. 0.02 radian
○ d. 0.01 radian

No, the answer is incorrect.
Score: 0
Accepted Answers:
d. 0.01 radian

37) Calculate difference of actual triangular pulse and modified rectangular pulse (at FWHM) expressed in terms of P_t. ***1 point***

○ a. 0.77 P_t
○ b.0.55 P_t
○ c. 0.33 P_t
○ d. 0.11 P_t

No, the answer is incorrect.
Score: 0
Accepted Answers:
c. 0.33 P_t

Following data is given for an airborne LiDAR mission flying height = 500 m, aircraft speed = 56 m/s, scanning angle = 20, PRF = 100,000, Hz = 100 kHz, scanning frequency = 40 Hz, scanning mechanism zigzag (saw tooth). Solve following problems from 38 to 50:

38) If 10% overlap is required between two consecutive strips, calculate the effective swath. ***1 point***

○ a. 328.57 m
○ b. 327.57 m
○ c. 329.67 m
○ d. 326.87 m

No, the answer is incorrect.
Score: 0
Accepted Answers:
b. 327.57 m

39) Calculate nominal pulse spacing (NPS). ***1 point***

○ a. 0.521 m
○ b. 0.451 m
○ c. 0.621 m
○ d. 0.765 m

No, the answer is incorrect.
Score: 0
Accepted Answers:
b. 0.451 m

40) Ratio of along track to across track data spacing? *1 point*

○ a. 1: 3.44
○ b. 1: 5.44
○ c. 1: 7.44
○ d. 1: 9.44

No, the answer is incorrect.
Score: 0

Accepted Answers:
a. 1: 3.44

41) Calculate worst horizontal resolution and best horizontal resolution. *1 point*

○ a. 0.31 m and 0.17 m
○ b. 0.41 m and 0.27 m
○ c. 0.51 m and 0.37 m
○ d. 0.61 m and 0.47 m

No, the answer is incorrect.
Score: 0

Accepted Answers:
a. 0.31 m and 0.17 m

42) If a rectangular area (3 km width and 6 km length) is to be covered by airborne LiDAR data acquisition, calculate the time of data acquisition, if each turn takes 3 minute time. (assume cushion period = 0) *1 point*

○ a. 45.757 min
○ b. 47.957 min
○ c. 44.857 min
○ d. 43.557 min

No, the answer is incorrect.
Score: 0

Accepted Answers:
c. 44.857 min

43) There is wind of speed 6 m/s and aircraft is flying against wind direction (head wind) on a flight line and flying in direction of wind (tail wind) on next consecutive flight line. Calculate the ratio of data densities for against wind side and in direction of wind side. *1 point*

○ a. 51: 45
○ b. 41: 35
○ c. 31: 25
○ d. 21: 15

No, the answer is incorrect.
Score: 0

Accepted Answers:
c. 31: 25

44) If ratio of alongside scanning and across side scanning is one, which one of the following two statements are made: Statement 1: Across track spacing is equal to NPS. Statement 2: Along track spacing will be equal to approximately 1.5 times NPS. *1 point*

○ a. Both statement 1 and statement 2 are false
○ b. Statement 1 is true, statement 2 is false
○ c. Statement 1 is false, statement 2 is true
○ d. Both statement 1 and statement 2 are true

No, the answer is incorrect.
Score: 0

Accepted Answers:
d. Both statement 1 and statement 2 are true

45) Calculate number of points in one scan line. *1 point*

○ a. 1280 points/line.
○ b. 1260 points/line.
○ c. 1250 points/line.
○ d. 1270 points/line

No, the answer is incorrect.
Score: 0

Accepted Answers:
c. 1250 points/line.

46) Calculate number of points captured during one oscillation of scanning mirror. *1 point*

○ a.2700 points/oscillation.
○ b.2500 points/oscillation.
○ c.2800 points/oscillation.
○ d.2600 points/oscillation.

No, the answer is incorrect.
Score: 0

Accepted Answers:
b.2500 points/oscillation.

47) Calculate vertical resolution. *1 point*

○ a. 489.132 m
○ b. 499.132 m
○ c. 479.132 m
○ d. 469.132 m

No, the answer is incorrect.
Score: 0

Accepted Answers:
b. 499.132 m

48) If horizontal accuracy (1σ) of LiDAR point is 15 cm and vertical accuracy (1σ) is 8 cm, calculate vertical accuracy on an inclined plane of 20°. And calculate the percentage (%) increase/decrease vertical accuracy of LiDAR data. ***1 point***

○ a. 13.46 cm and increase by 65.24%
○ b. 13.46 cm and decrease by 68.24%
○ c. 15.46 cm and increase by 65.24%
○ d. 15.46 cm and decrease by 68.24%

No, the answer is incorrect.
Score: 0
Accepted Answers:
b. 13.46 cm and decrease by 68.24%

49) If data density is to be increased by 20% from its current value and min. flying height is restricted to 300 m, which of the following combination of flying height, velocity and FOV will achieve 20% increase in data density. ***1 point***

○ a. 8494.73
○ b. 7890.67
○ c. 8678.97
○ d. 7789.98

No, the answer is incorrect.
Score: 0
Accepted Answers:
a. 8494.73

50) Calculate the error propagates in data density if FOV(⌀), aircraft speed (V), and flying height (H) have (1σ) error as follows: ***1 point***
$H = 500m, V = 56m/s, \emptyset = \pm 20^\circ \sigma_H = \pm 5m, \sigma_V = \pm 1m/s, \sigma_\emptyset = \pm 0.1^\circ$

○ a. 1.53
○ b. 1.73
○ c. 2.53
○ d. 2.73

No, the answer is incorrect.
Score: 0
Accepted Answers:
a. 1.53

51) Consider the following two statements: Statement 1: Data density in overlap area of LiDAR increases theoretically. Statement 2: In an airborne mission, scanner parameters (Scanning frequency, scanner FOV, PRF) are not changed during a flight for data acquisition whereas flying parameters (heights, speed, and direction) are changed to achieve better results. ***1 point***

○ a. Both statement 1 and statement 2 are false
○ b. Statement 1 is true , statement 2 is false
○ c. Statement 1 is false , statement 2 is true
○ d. Both statement 1 and statement 2 are true

No, the answer is incorrect.
Score: 0
Accepted Answers:
b. Statement 1 is true , statement 2 is false

52) Consider following two statements: Statement 1: LiDAR can achieve data density values in wide range from less than $1p/m^2$ to even more than 60 p/m^2 . Statement 2: High data density ($> 8p/m^2$) is required to create DEM of flood plane which are almost flat and horizontal. ***1 point***

○ a. Both statement 1 and statement 2 are false
○ b. Statement 1 is true , statement 2 is false
○ c. Statement 1 is false , statement 2 is true
○ d. Both statement 1 and statement 2 are true

No, the answer is incorrect.
Score: 0
Accepted Answers:
b. Statement 1 is true , statement 2 is false

53) Consider following two statements: Statement 1: Complementary vertical accuracy (CVA) is required to report the accuracies of all types of land covers (vegetation, building, road) Statement 2: When error don't follow normal distribution for LiDAR data, 95 percentile criterion should be used. ***1 point***

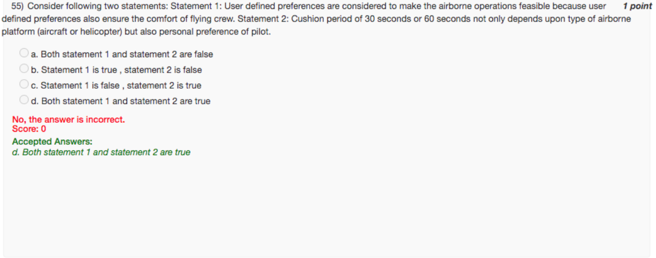
○ a. Both statement 1 and statement 2 are false
○ b. Statement 1 is true , statement 2 is false
○ c. Statement 1 is false , statement 2 is true
○ d. Both statement 1 and statement 2 are true

No, the answer is incorrect.
Score: 0
Accepted Answers:
d. Both statement 1 and statement 2 are true

54) Consider following two statements: Statement 1: In general airborne LiDAR vertical accuracy is almost twice of horizontal accuracy. Statement 2: Above facts is not applicable to other techniques like photogrammetry and GPS. ***1 point***

○ a. Both statement 1 and statement 2 are false
○ b. Statement 1 is true , statement 2 is false
○ c. Statement 1 is false , statement 2 is true
○ d. Both statement 1 and statement 2 are true

No, the answer is incorrect.
Score: 0
Accepted Answers:
d. Both statement 1 and statement 2 are true



55) Consider following two statements: Statement 1: User defined preferences are considered to make the airborne operations feasible because user defined preferences also ensure the comfort of flying crew. Statement 2: Cushion period of 30 seconds or 60 seconds not only depends upon type of airborne platform (aircraft or helicopter) but also personal preference of pilot. ***1 point***

○ a. Both statement 1 and statement 2 are false

○ b. Statement 1 is true , statement 2 is false

○ c. Statement 1 is false , statement 2 is true

○ d. Both statement 1 and statement 2 are true

No, the answer is incorrect.
Score: 0

Accepted Answers:
d. Both statement 1 and statement 2 are true