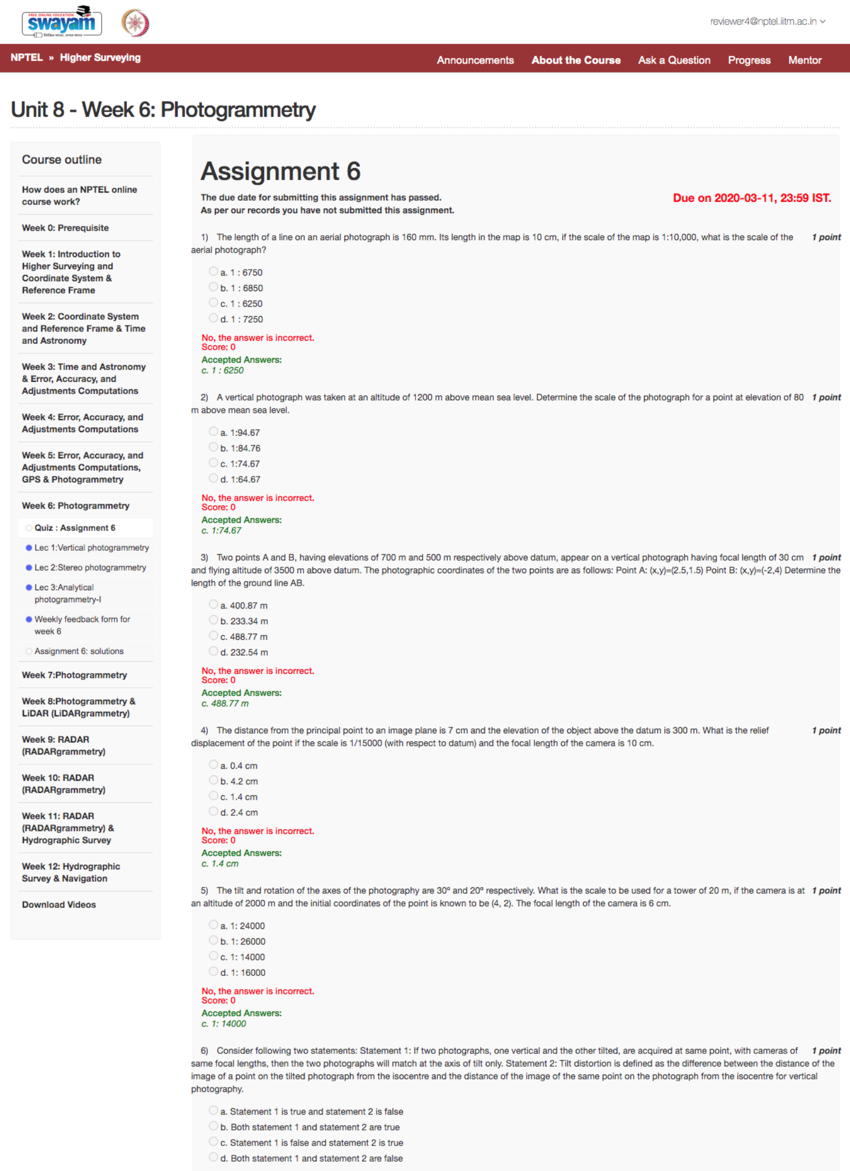

Unit 8 - Week 6: Photogrammetry

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

- ○ **Quiz : Assignment 6**
- ● Lec 1:Vertical photogrammetry
- ● Lec 2:Stereo photogrammetry
- ● Lec 3:Analytical photogrammetry-I
- ● Weekly feedback form for week 6
- ○ Assignment 6: solutions

Week 7:Photogrammetry

Week 8:Photogrammetry & LiDAR (LiDARgrammetry)

Week 9: RADAR (RADARgrammetry)

Week 10: RADAR (RADARgrammetry)

Week 11: RADAR (RADARgrammetry) & Hydrographic Survey

Week 12: Hydrographic Survey & Navigation

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Assignment 6

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

Due on 2020-03-11, 23:59 IST.

1) The length of a line on an aerial photograph is 160 mm. Its length in the map is 10 cm, if the scale of the map is 1:10,000, what is the scale of the aerial photograph? ***1 point***

- ○ a. 1 : 6750
- ○ b. 1 : 6850
- ○ c. 1 : 6250
- ○ d. 1 : 7250

No, the answer is incorrect.
Score: 0
Accepted Answers:
c. 1 : 6250

2) A vertical photograph was taken at an altitude of 1200 m above mean sea level. Determine the scale of the photograph for a point at elevation of 80 m above mean sea level. ***1 point***

- ○ a. 1:94.67
- ○ b. 1:84.76
- ○ c. 1:74.67
- ○ d. 1:64.67

No, the answer is incorrect.
Score: 0
Accepted Answers:
c. 1:74.67

3) Two points A and B, having elevations of 700 m and 500 m respectively above datum, appear on a vertical photograph having focal length of 30 cm and flying altitude of 3500 m above datum. The photographic coordinates of the two points are as follows: Point A: (x,y)=(2.5,1.5) Point B: (x,y)=(-2,4) Determine the length of the ground line AB. ***1 point***

- ○ a. 400.87 m
- ○ b. 233.34 m
- ○ c. 488.77 m
- ○ d. 232.54 m

No, the answer is incorrect.
Score: 0
Accepted Answers:
c. 488.77 m

4) The distance from the principal point to an image plane is 7 cm and the elevation of the object above the datum is 300 m. What is the relief displacement of the point if the scale is 1/15000 (with respect to datum) and the focal length of the camera is 10 cm. ***1 point***

- ○ a. 0.4 cm
- ○ b. 4.2 cm
- ○ c. 1.4 cm
- ○ d. 2.4 cm

No, the answer is incorrect.
Score: 0
Accepted Answers:
c. 1.4 cm

5) The tilt and rotation of the axes of the photography are 30° and 20° respectively. What is the scale to be used for a tower of 20 m, if the camera is at an altitude of 2000 m and the initial coordinates of the point is known to be (4, 2). The focal length of the camera is 6 cm. ***1 point***

- ○ a. 1: 24000
- ○ b. 1: 26000
- ○ c. 1: 14000
- ○ d. 1: 16000

No, the answer is incorrect.
Score: 0
Accepted Answers:
c. 1: 14000

6) Consider following two statements: Statement 1: If two photographs, one vertical and the other tilted, are acquired at same point, with cameras of same focal lengths, then the two photographs will match at the axis of tilt only. Statement 2: Tilt distortion is defined as the difference between the distance of the image of a point on the tilted photograph from the isocentre and the distance of the image of the same point on the photograph from the isocentre for vertical photography. ***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

7) Read the following statement and choose appropriate reason for this: 'To determine the scale of a tilted photograph, the position of the points must be known with respect to the principal line'. ***1 point***

○ a. Because the tilt is independent of the position of the principal point
○ b. Because the tilt is independent of the distance of the points from the principal point
○ c. Because the tilt takes place along the principal line
○ d. Because the tilt takes place opposite to principal line

No, the answer is incorrect.
Score: 0
Accepted Answers:
c. Because the tilt takes place along the principal line

8) If it is required to tie the different photos together in the aerial photography using common points acquired in images, what is the most desirable consideration that needs to be addressed? ***1 point***

○ a. The isocentre, the principal point and the point on the ground should satisfy the collinearity condition
○ b. The isocentre should appear on the edges of as many adjacent strips as possible
○ c. The line joining isocentre and the principal point of each photo should be aligned in the direction of the flight
○ d. The principal point of each photo should appear on the edges of as many adjacent strips as possible

No, the answer is incorrect.
Score: 0
Accepted Answers:
c. The line joining isocentre and the principal point of each photo should be aligned in the direction of the flight

Read the following paragraph and answer the questions from 9 to 15:
An area 20 km long in the North-South direction and 15 km in the East-West direction is to be photographed with camera having 20 cm focal length for the purpose of constructing a mosaic. The photograph size is 30 cm x 30 cm. The average scale is to be 1: 15000 effective at an elevation of 200 m above datum. Endlap is 60% and sidelap is 30%. The ground speed of the aircraft is 300 km per hour. The flight lines are to be laid out in a North-South direction on an existing map having a scale of 1: 50000. The two outer flight lines are to coincide with the East and West boundaries of the area.

9) Determine the flying height. ***1 point***

○ a. 3400 m
○ b. 2200 m
○ c. 3200 m
○ d. 2400 m

No, the answer is incorrect.
Score: 0
Accepted Answers:
c. 3200 m

10) Determine the theoretical ground spacing of the flight lines. ***1 point***

○ a. 3150 m
○ b. 3350 m
○ c. 3550 m
○ d. 3750 m

No, the answer is incorrect.
Score: 0
Accepted Answers:
a. 3150 m

11) Determine the actual spacing of flight lines. ***1 point***

○ a. 1550 m
○ b. 2000 m
○ c. 2550 m
○ d. 3000 m

No, the answer is incorrect.
Score: 0
Accepted Answers:
d. 3000 m

12) Determine the spacing of flight lines on flight map. ***1 point***

○ a. 5 cm
○ b. 6 cm
○ c. 7 cm
○ d. 8 cm

No, the answer is incorrect.
Score: 0
Accepted Answers:
b. 6 cm

13) Determine the ground distance between exposures ***1 point***

○ a. 1600 m
○ b. 1700 m
○ c. 1800 m
○ d. 1900 m

No, the answer is incorrect.
Score: 0

Accepted Answers:
c. 1800 m

14) Determine the adjusted ground distance between exposures. ***1 point***

○ a. 1949 m
○ b. 1849 m
○ c. 1749 m
○ d. 1649 m

No, the answer is incorrect.
Score: 0

Accepted Answers:
c. 1749 m

15) Determine the number of photographs per flight line ***1 point***

○ a. 13
○ b. 15
○ c. 17
○ d. 19

No, the answer is incorrect.
Score: 0

Accepted Answers:
a. 13

16) Consider following three statements regarding the ideal conditions for the stereoscopic views of the ground surface in aerial photography: Statement 1: Sufficient overlap should be there between adjacent images. Statement 2: The elevation of the camera position for the two stereoscopic images is not important. Statement 3: The camera axis should be vertical so that the image planes lie in the same horizontal plane. ***1 point***

○ a. Statement 1 is true, statement 2 is false and statement 3 is true.
○ b. Statement 1 is false, statement 2 is true and statement 3 is false
○ c. Statement 1 is true, statement 2 and statement 3 are false
○ d. Statement 1 is false, statement 2 and statement 3 are true

No, the answer is incorrect.
Score: 0

Accepted Answers:
a. Statement 1 is true, statement 2 is false and statement 3 is true.

17) A photograph is acquired from a height of 2000 m with a camera of focal length 20 cm. The height of a point above the datum is 2 m. The image coordinates of the point is (2, 4). Find the ground coordinates of the point. ***1 point***

○ a. (18980, 26990)
○ b. (18980, 29960)
○ c. (19890, 36990)
○ d. (19980, 39960)

No, the answer is incorrect.
Score: 0

Accepted Answers:
d. (19980, 39960)

18) A flag pole appears in two successive photographs acquired at an altitude of 3000 m above datum. The focal length of the camera is 150 mm and the length of the air base is 300 m. The parallaxes for the top of the pole is 72.72 mm and for the bottom is 58.27 mm, respectively. Find the difference in elevation of top and bottom of the pole. ***1 point***

○ a. 173.4 m
○ b. 153.4 m
○ c. 133.4 m
○ d. 113.4 m

No, the answer is incorrect.
Score: 0

Accepted Answers:
b. 153.4 m

19) Consider following two statements: Statement 1: It is essential to create stereo vision in animals for 3D depth perception through vision. Statement 2: Stereo vision can be created only if there are two exposure of the object simultaneously without any delay. ***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

20) A pair of photographs are captured with an aerial camera from an altitude of 3000 m above MSL. The mean principal base measured is equal to 100 mm. The difference in parallax between two points is 3.48 mm. Find the difference in height between the two points if the elevation of the lower point is 600 m above datum. ***1 point***

○ a. 125 m
○ b. 105 m
○ c. 85 m
○ d. 65 m

No, the answer is incorrect.
Score: 0

Accepted Answers:
d. 65 m

21) Which of the following is true regarding lens distortion? *1 point*

○ a. It affects the resolution of image
○ b. It affects the metric accuracy of image
○ c. It affects the sharpness of image
○ d. It affects the contrast of image

No, the answer is incorrect.
Score: 0

Accepted Answers:
b. It affects the metric accuracy of image

22) If we assume 5th order polynomial function for correcting the radial distortion of image given that $a_0 = 0, a_1 = 3.47222 \times 10^{-}9, a_2 = 1.20563 \times 10^{-}13$, x = 56 and y = -77.92 (relative to principal point), what is the correction (Δr) required to be done for radial distortion? *1 point*

○

a. $4.0485 \times 10^{-}3$

○

b.$4.0485 \times 10^{-}2$

○

c. $4.4085 \times 10^{-}3$

○

d. $4.4085 \times 10^{-}2$

No, the answer is incorrect.
Score: 0

Accepted Answers:
a. $4.0485 \times 10^{-}3$

23) In vertical photography, it is known that light rays bend. Consider the following and choose the correct option: Statement 1: A light ray bends as refractive index changes when there is a change of air density. Statement 2: Velocity of the light ray increases while travelling through the air due to decrease in density in air. *1 point*

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

24) AA photograph is acquired from an altitude of 10 km, using an aerial camera of 141 mm focal length. Calculate the correction due to Earth curvature for a point which is 20 km away from the nadir. *1 point*

○ a. 8.94 mm
○ b. 0.0884 mm
○ c. 0.884 mm
○ d. 89.4 mm

No, the answer is incorrect.
Score: 0

Accepted Answers:
c. 0.884 mm

25) What will be the projective transformation between a point on a line to a point on another line (one dimensional)? *1 point*

○

a. $X' = (ax + cy + d)/(ex + fy + 1)$

○

b. $X' = (ax + d)/(ex + fy + 1)$

○

c. $X' = (ax + d)/(bx + 1)$

○

d. $X' = (ax + cy + d)/(ex + 1)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
c. $X' = (ax + d)/(bx + 1)$

26) Consider following two statements: Statement 1: For a camera, internal orientation parameters are constant throughout data acquisition of a scene. Statement 2: For a photo of the scene, the external orientation parameters are not constant. *1 point*

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

27) How will the x-coordinate of standard form of the collinearity equation get modified if the camera is at the origin of object/ world coordinate system? *1 point*

○ a. $x = -f[(X_p - X_0)m_{11} + (Y_p - Y_0)m_{13} + Z_p m_{12}]$

○ b. $x = -f[(X_p)m_{11} + (Y_p)m_{12} + Z_p m_{13}]$

○ c. $x = -f[(X_p)m_{12} + (Y_p)m_{11} + (Z_p - Z_0)m_{13}]$

○ d. $x = -f[(X_p)m_{13} + (Y_p)m_{11} + (Z_p - Z_0)m_{12}]$

No, the answer is incorrect.
Score: 0

Accepted Answers:
b. $x = -f[(X_p)m_{11} + (Y_p)m_{12} + Z_p m_{13}]$

28) For a conformal transformation by 60°, and scale factor of 1.5, what will be the transformed coordinates of a point located at (3, 4). ***1 point***

○ a. (8.45, -0.29)
○ b. (7.45, -0.29)
○ c. (8.45, -0.89)
○ d. (7.45, -0.89)

No, the answer is incorrect.
Score: 0

Accepted Answers:
d. (7.45, -0.89)

29) Consider the following and choose the correct option: Statement 1: The negative radial lens distortion has a shape of cushion, which is compressed from its two curved faces. Statement 2: Positive lens distortion displaces the image points such that the distorted points are situated on a cross section of a circular pipe. ***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) Consider the following and choose the correct option: Statement 1: The radial distortion correction is proportional to the second power of distortion itself. Statement 2: The corrections in each of image coordinates for radial distortion is assumed to be proportional to total radial distortion ***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

31) Consider the following and choose the correct option: Statement 1: Atmospheric correction cannot be characterized with ellipsoidal height of a point on surface of Earth. Statement 2: Atmospheric correction is not applicable to very small distance because atmosphere maintains the same temperature in near vicinity. ***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

32) Consider the following and choose the correct option: Statement 1: Earth curvature correction should be applied when the map is prepared from DGPS observations on UTM. Statement 2: Earth curvature correction is same for a points, which are lying on a circle on image. ***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

33) Consider the following and choose the correct option: Statement 1: Image motion increases if ratio of elevation of a point from datum increases. Statement 2: Image motion is in direction of flying direction as if speed of aircraft drags the film/ sensor in same direction and so image points shift in same direction. ***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

34) Find the percentage change in image motion if ratio of terrain elevation to flying height changes from 10% to 20%. ***1 point***

○ a. 12.2%
○ b. 12.3%
○ c. 12.4%
○ d. 12.5%

No, the answer is incorrect.
Score: 0

Accepted Answers:
d. 12.5%

35) Image motion values of two points on terrain, having elevations h_1 and h_2 are observed. The ratio of the elevation of point 1 (h_1) with respect to flying height (H) is equal to r_1 .In order to maintain the same image motion at two points, if speed of aircraft is increased by 10%, what should be the value of ratio (r_2), which is equal to the ratio of elevation of terrain point (h_2) to flying height (H)? ***1 point***

○ a. $r_2 = (r_1/(0.1 - r_1))$

○ b. $r_2 = (r_1/(0.9 - r_1))$

○ c. $r_2 = (r_1/(2.1 - r_1))$

○ d. $r_2 = (r_1/(1.1 - r_1))$

No, the answer is incorrect.
Score: 0

Accepted Answers:
c. $r_2 = (r_1/(2.1 - r_1))$

36) Consider the following and choose the correct option: Statement 1: In conformal transformation, the scale in x direction may change but scale in x direction does in y direction. Statement 2: Translation after rotation and rotation after translation, both processes result to same change in coordinates for conformal transformation. ***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

37) Consider the following and choose the correct option: Statement 1: If the scale factor in x and y direction are same, then the affine transformation is simplified to conformal transformation. Statement 2: Translation is different in conformal and affine transformation and other factors are same. Conformal and affine transformations will result the same. ***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

38) Consider the following and choose the correct option: Statement 1: Projective transformation are based on a premise that three pairs of, of each of two points are points in two planes are originating along a direction from a common point. Statement 2: Projective transformation can be written between two planes provided there are three points in each plane, which are connected through points in a straight line. ***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

39) Consider the following and choose the correct option: Statement 1: In projective transformation, two planes which are connected to each other due to one to one correspondence between pair of points in two planes. These planes can be parallel. Statement 2: In projective transformation between two planes, two points in each plane should originate from one point that also lies in the same plane. ***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

40) Consider the following and choose the correct option: Statement 1: In projective transformation between image plane and ground surface, number of coefficients are 12. Statement 2: In projective transformation, we believe that the origin of image reference frame lies at perspective center of camera. ***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

41) ***1 point***

Consider the following and choose the correct option:

Statement 1: In polynomial transformation, the number of coefficients depends up on the order and number of dimensions of polynomial.

Statement 2: In polynomial transformation, the number of coefficients in one coordinate (say x) can be calculated by following summation of coefficients$= 1 + \sum_{i=1}^{n}[i \times p]$, where $n =$ order of polynomial, $p =$ number of dimensions$= 3$.

○ 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