

Midterm Exam

Nov. 4th, 2021

1. Explain/solve followings. [48]
 - 1) Definition of photogrammetry and three types of photograph [4]
 - 2) Definition of refractive index and Snell's law. [2]
 - 3) Definitions of optical axis, focal point, focal length, and focal plane [4].
 - 4) Explain the lens formula [3]
 - 5) Definition of depth of field and effects of aperture, focal length, and object distance on the depth of field [4]
 - 6) Explain how to calculate total exposure and meaning of f-stop [2]
 - 7) Five elements of interior orientation (내부표정요소) [3]
 - 8) Compare graphically the geodetic, geocentric, and local vertical coordinate systems. [6]
 - 9) Compare two conformal map projection methods: Lambert conformal conic and transverse Mercator. [8]
 - 10) Definition of parallax [2]
 - 11) Explain collinearity condition [10]

2. A camera calibration report specifies the calibrated focal length $f = 153.206$ mm and coordinates of the calibrated principal point as $x_p = 0.008$ mm and $y_p = -0.001$ mm. The report also provides a function of radial lens distortion from the principal point as below. Using this function of distortion, compute the corrected coordinates for an image point having coordinates $x = 62.579$ mm, $y = -80.916$ mm relative to the fiducial axes. [10]

$$\Delta r = 0.2296r - 35.89r^3 + 1,018r^5 + 12,100r^7$$

3. The highest terrain, average terrain, and lowest terrain are 610, 460, 310 m above mean sea level, respectively. Calculate the maximum, minimum, and average scales if flying height above mean sea level is 3,000 m and the camera focal length is 152.4 mm. [12]

4. A vertical photo taken from an elevation of 535 m above mean sea level. The elevation at the base of a tower in the photo is 259 m above MSL. The relief distance d of the tower is 54.1 mm, and the radial distance to the top of the tower from the photo center was 121.7 mm. What is the height of the tower? [10]

5. A pair of overlapping vertical photographs was taken from a flying height of 1,233 m above sea level with a 152.4-mm of focal length. The air base was 390 m. Flight-line coordinates for points a and b are $x_a = 53.4\text{mm}$, $y_a = 50.8\text{mm}$, $x'_a = -38.3\text{mm}$, $y'_a = 50.9\text{mm}$, $x_b = 88.9\text{mm}$, $y_b = -46.7\text{mm}$, $x'_b = -7.1\text{mm}$, $y'_b = -46.7\text{mm}$. Elevation of points A and B, and the horizontal length of line AB? [10]

6. In the computation of the elevation of point A in Problem 5, suppose that the random errors were ± 2 m in H , ± 2 m in B , and ± 0.1 mm in p_a . Compute the resulting error in h_A due to the presence of these errors. [10]