University of Technology
Building and Construction Eng. Dept.
Final Exam – FIRST Attempt – 2010/2011

Subject : Remote Sensing **Class: 3rd Year**
Branch :All Engineering Branches **Time : 3 Hours**
Examiner: Remote Sensing Comm. **Date : 1/ 6/ 2011**

Note: Answer FOUR questions only

Q1 A- An image with 8 brightness values, the image has the following histogram

Gray level value	0	1	2	3	4	5	6	7
Frequency (No. of Pixels)	10	8	9	2	14	1	5	2

Apply histogram equalization to above data showing with drawing the original and the equalized histogram with their frequency of pixels in each brightness value.

B- Answer the following items:

1. Explain with equations, how you calculate the ground horizontal distance and ground coordinates from vertical aerial photos.
2. Explain briefly the main distortions (deformations) in aerial photos.
3. What are the main bases for the classification of remote sensing systems.

Q2 A- Compare between the following:

1. Vertical and oblique aerial photos.
2. Transit and Navastar in GPS.
3. Low and high resolution satellites.

B- Two buildings on flat terrain are separated in the range direction by a distance along the ground by 200 m. knowing that the radar system has the following characteristics: a wavelength of 23cm, antenna length of 2 m, and a pulse length of 1 μ sec. If the buildings were imaged in the far range with an incidence angle of 60° degrees and however, the same buildings were imaged in the near range with a depression angle of 60° degrees. Find the ground-range resolution and the azimuth resolution for both cases. Will these buildings be resolved in the far range and near range?

Q3 A- Answer the following:

1. In an oblique aerial photo define the following with diagram: nadir line , optical axis, negative and positive planes, focal length, and isocenter line,
2. Show the difference between map and an aerial photo.
3. Differentiate between selective and non-selective scattering.

B- A vertical photo with a format 23 cm× 23 cm was taken from an elevation of 2125 m above mean sea level (M.S.L.), camera focal length 304 mm and the longitudinal overlap was 60%. A vertical chimney was appeared in the photo with an elevation at its base 225 m above M.S.L. Knowing that the coordinate of the top of the chimney is: y_a = - 6.3 mm; Y_A = -35m. Find:

1. The height of the chimney.
2. The amount of vertical exaggeration.

Q4 A- Answer the following:

1. How can you calculate the spectral reflectance by radiance and irradiance method. Explain with equations.
2. Define geometric correction, what is the main purpose of doing it and what are its main conditions and stages?

B- Table below shows a digital image (3×5), it is required to apply low-pass filter (LPF) and high-pass filter (HPF) for the pixel (R_2 , C_3), discuss how the DNs change for this image.

20	**18**	**2**	**19**	**18**
24	**20**	**5**	**24**	**19**
32	**23**	**1**	**18**	**29**

Q5 A- Answer the following:

1. Show the basic principles of GPS and GPR explaining their main uses.
2. Radar is active systems show its advantages and applications with respect to other remote sensing systems?
3. Define contrast, what are its types showing the equation for each one in case of neglecting atmospheric effect.

B- An area with 16 km ~~long~~ wide and 25 km ~~wide~~ long with mean elevation 300 m above mean sea level (M.S.L.), is to be surveyed along 5 flight lines to take an aerial photo with dimension 230 mm ×180 mm by a plane, its speed is 360 km/ hr with camera focal length is 150 mm, photo scale 1/25 000 and the time between each successive two photos is 18 sec. Find :

1. The amount of longitudinal overlap and lateral overlap (sidelap).
2. The total number of theoretical and actual photos.
3. The area of each photo.

Q6 A- Answer the following:

1. Compare between TM and MSS.
2. Give the differences between Geoid and ellipsoid.
3. What is the nature of thermal path and how it differs with the nature of a body, explain it with equations.

B- A radar signal sent out by a GPR into two different media dry sand and wet clay. It is found their relative dielectric constants were 10.0 and 40.0 respectively and the electrical conductivity of the dry sand was 0.01 S/m. Find:

1. The reflection coefficient and its grade ;
2. The radar wave velocities in the two media ;
3. The depth of penetration.

Best Wishes.....