American University of Beirut
Geology 313
Final Exam

Student Name:_____ February 5, 1996

Part I. Choose the best answer (20 pts.)

1. The colors of visible light ranging from shorter to longer wavelengths are:

a. red, green and blue
b. blue, green and red
c. green, blue and red
d. green, red and blue
e. red, blue and green
f. blue, red and green

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2. The shortest rays (wavelength) in the electromagnetic spectrum, are . . . rays, then followed by . . . rays.

a. x . . . ɣ
b. cosmic . . . x
c. cosmic . . . ɣ
d. x . . . cosmic
e. ɣ . . . cosmic
f. ɣ . . . x

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3. Fog and clouds appear white due to . . . scatter

a. Rayleigh
b. Mie
c. nonselective
d. Wien

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4. Compared to photographic systems, electronic sensors offer the following advantages:

a. inexpensive, relatively simple and provide high degree of spatial detail
b. inexpensive, improved calibration potential, and a broader spectral range of sensitivity
c. improved calibration potential, high degree of spatial detail and geometric integrity
d. broader spectral range of sensitivity, improved calibration potential and the ability to electronically transmit data.

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5. Using panoramic cameras the terrain is scanned from side to side, . . . to the direction of flight. However their photographs . . . the geometric fidelity of frame camera images.

a. parallel . . . have
b. parallel . . . lack
c. transverse . . . have
d. transverse . . . lack

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6. The use of aerial video recorders has the following advantages when compared with small format aerial film or digital photography:

a. inexpensive (material costs), has an audio track, can be viewed at the time of data acquisition, and can be analyzed immediately after the flight.
b. inexpensive, has relatively high spatial resolution, has an audio track, can be viewed at the time of data acquisition
c. has relatively high spatial resolution, has an audio track, can be analyzed immediately after the flight, has faster "shutter speeds"
d. can be viewed at the time of data acquisition, has an audio track, can be analyzed immediately after the flight, has faster "shutter speeds".

7. The best light penetration in clear water body is achieved between the wavelengths of . . . μm, which can penetrate . . . m in clear, calm ocean water.

a. 0.48 - 0.60 . . . 1.5 - 2
b. 0.7 - 0.9 . . . 1.5 - 2
c. 0.48 - 0.60 . . . 15 - 20
d. 0.7 - 0.9 . . . 15 - 20

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8. Coarse textured drainage patterns develop . . . internal drainage with . . . surface runoff.

a. good . . . little
b. good . . . high
c. poor . . . little
d. poor . . . high

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9. The most common use of photogrammetry is in the preparation of:

a. geologic maps
b. topographic maps
c. agricultural maps
d. engineering plans

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10. The magnitude of relief displacement depends on the:

a. flying height
b. distance from the photo principal point
c. height of the feature
d. all of the above
e. none of the above

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11. Flights are usually scheduled between . . . for maximum illumination and minimum shadow.

a. 9 A.M. and 1 P.M.
b. 9 A.M. and 3 P.M.
c. 10 A.M. and 4 P.M.
d. 10 A.M. and 2 P.M.

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12. Photographic systems are limited to the spectral range . . . μm, whereas multispectral scanners can extend the range of sensing from . . . μm.

a. 0.3 to 0.9 . . . 0.3 to 3
b. 0.3 to 0.9 . . . 0.3 to 14
c. 0.4 to 0.7 . . . 0.3 to 3
d. 0.4 to 0.7 . . . 0.3 to 14

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13. In spite of many advantages, there is one disadvantage to pushbroom systems in comparison with whiskbroom scanning:

a. the need to calibrate many more detectors
b. lower geometric integrity
c. the detectors have shorter dwell time
d. shorter life expectancy

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14. Imaging spectrometers, or hyperspectral scanners, are instruments that acquire multispectral images in many . . . contiguous spectral bands throughout the visible, near-IR and mid-IR portions of the spectrum. These systems typically collect . . . or more channels of data.

a. very narrow . . . 50
b. very narrow . . . 200
c. narrow . . . 25
d. narrow . . . 100

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15. In . . . the first American space workshop was launched, and its astronauts took over 35,000 images of the earth with the Earth Resources Experiment Package (EREP) on board.

a. 1961 b. 1968 c. 1973 d. 1975

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16. Except for thermal band, the ground resolution of MSS sensors is about . . . m, whereas that of TM sensors is . . . m.

a. 80 . . . 15
b. 80 . . . 30
c. 120 . . . 15
d. 120 . . . 30

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17. The orbit (altitude) of Landsat -4, and -5 are . . . km, whereas that for Landsat -1, -2, and -3 are . . . km.

a. 705 . . . 830
b. 705 . . . 900
c. 550 . . . 830
d. 550 . . . 900

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18. The microwave portion of the spectrum includes wavelengths within the approximate range of . . . .

a. 14 μm to 1 mm
b. 3 μm to 14 mm
c. 1 mm to 1m
d. 14 μm to 1 m

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19. Depending on the wavelengths involved, microwave energy can see through:

a. haze
b. light rain and snow
c. clouds and smoke
d. all of the above
e. none of the above

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20. In 1971, a radar survey was begun in . . . that resulted in the mapping of nearly 500,000 sq km of land

a. Brazil
b. Columbia
c. Panama
d. Venezuela

Part II. Fill in the blanks (20 Pts.)

1. The most efficient absorbers of solar radiation are : _____,

_____ and ozone.

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2. The procedure of photographic (black and white) processing entails the following: 1)_____; 2) stop bath; 3)_____; 4)_____ _____; and 5)_____.

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3. Magenta light is the mixture of blue and red; yellow light is produced by mixing _____; Cyan light is the mixture of _____.

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4. A _____ (CCD) is a _____ _____ chip or a solid state sensor that detects electromagnetic energy.

5. The scale S of aerial photograph is computed as the ratio of _____ _____ or for a vertical photograph taken over flat terrain is computed as the ratio of _____ _____.

6. The ground resolution distance (GRD) is computed as _____ _____ to the system resolution, for example _____ _____.

7. Most airphoto applications consider the following basic characteristic, or variations of them: _____, _____, pattern, _____, _____, site and association.

8. The elimination key (airphoto interpretation) is arranged so that the interpretation proceeds _____ _____.

9. The main advantages of scanning mirror stereoscope compared to lens and mirror stereoscopes are:_____ _____.

10. The term land cover relates to _____ _____, for example _____ _____.

11. The term land use relates to _____ _____, for example _____ _____.

12. Orthophotos are prepared in instruments called _____ , here the floating mark is a very small slit in a _____.

13. Photographic systems require an onboard supply of film that must be _____ _____ to the ground for processing, whereas MSS data may be _____ to ground.

14. _____ (IFOV) is normally expressed as the _____, with which incident energy is focused on the detector.

15. In "Radiation from Real Materials" a _____ has an emissivity that is less than 1 but is constant at all wavelength. However, if the emissivity of an object varies with wavelength, the object is said to be a _____.

16. The types of sensors used on Landsat -1 to 6 missions are: _____ _____ (RBV) camera system; _____(MSS) systems; _____ (TM); and _____ _____ (ETM).

17. Data merging and GIS integration (Digital Image Processing) is used to combine _____ with _____ _____.

18. In contrast to spectral filters, spatial filters _____ _____.

19. Convolving an image involves the following procedures: _____ _____ _____.

20. Spectral ratioing or ratio images are enhancements resulting from the division of _____ _____.

Part III. Circle T = true or F = false

T F 1. According to wave theory the energy of a quantum (photons or quanta) decreases with decreasing wavelength.

T F 2. The dominant wavelength, or wavelength at which a blackbody radiation curve reaches a maximum (Wien's displacement law) decreases with its temperature increase

T F 3. Water and vegetation might reflect nearly equally in visible wavelengths yet these features are almost always separable in near-infrared wavelengths.

T F 4. Photographic film can "see" and record over a wavelength range about twice as broad as that of the human eye (0.3 to 0.9 μm versus 0.4 to 0.7 μm)

T F 5. Antivignetting filters (used to improve the uniformity of exposure throughout an image) are designed to be strongly absorbing in their circumferential area and progressively transparent in their central area.

T F 6. The shutter for a strip camera remains open continuously while the picture is made, and the resulting imagery is distorted by any change in aircraft orientation, speed, or altitude.

T F 7. Although the current resolution of digital imaging systems is very good, images are not as detailed as those imaged onto photographic film of similar format.

T F 8. Either paper prints or film transparencies can be viewed using stereoscope. Paper prints are more convenient to handle, better suited to field use and have better spatial resolution; whereas transparencies are more easily annotated and have better color fidelity.

T F 9. Polar planimeter mechanically computes area, of an irregularly shaped region, as the interpreter traces around the boundary of the area in counter clockwise direction.

T F 10. The reflection of sunlight from bare (unvegetated) soil surfaces depends on many interrelated factors, including soil moisture content, soil texture, surface roughness, the presence of iron oxide, and the organic matter content.

T F 11. The term parallax refers to the apparent change in relative positions of stationary objects caused by a change in viewing position.

T F 12. Ground control refers to physical points on the ground, whose ground positions are known with respect to vertical datum.

T F 13. All stereoplotters are made up of three basic components: a viewing system, a measuring system, and tracing system.

T F 14. Anaglyphic viewing systems can be used with black and white and color photography, but it cannot be used with false color photography.

T F 15. Weather is one of the most important parameters in aerial missions, as it is beyond the control of the planner.

T F 16. In comparison with multispectral scanners, multiband photographic data are somewhat difficult to calibrate radiometrically because they stem from the photochemical processes of photography.

T F 17. In the thermal spectrum, water has nearly negligible reflectance, therefore its emissivity is about 0.1.

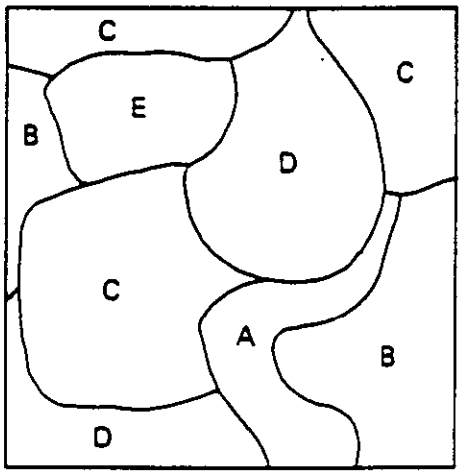
T F 18. Terrain temperatures are normally higher than those of water during the day (8 A.M. - 9 P.M.) and lower than water temperatures during the night.

T F 19. The optical spectrum ranges between 0.3 and 3 μm and it is termed so because lenses and mirrors can be used to refract and reflect such energy.

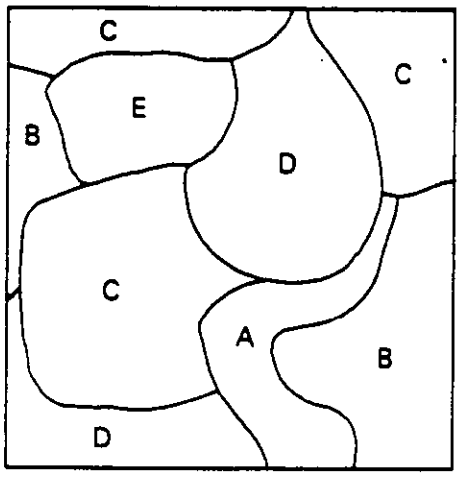
T F 20. With increasing orbit altitude the satellite orbital period decreases.

Part IV. Answer only eight of the following ten questions (40 pts.)

1. Draw on the plans (Figure 1) the raster and vector formats - *(two approaches used in GIS to represent the locational component of geographic information.)*



(a) Original line map



(a) Original line map

Figure 1

2. Indicate and discuss each of the following types (Figure 2) of geometric effects influencing the apparent reflectance and exposure.

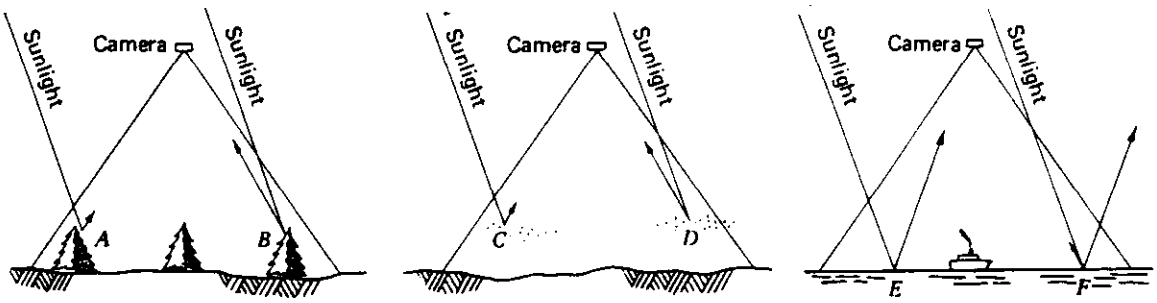


Fig. 2

5. Using Figure 5 explain floating mark principle.

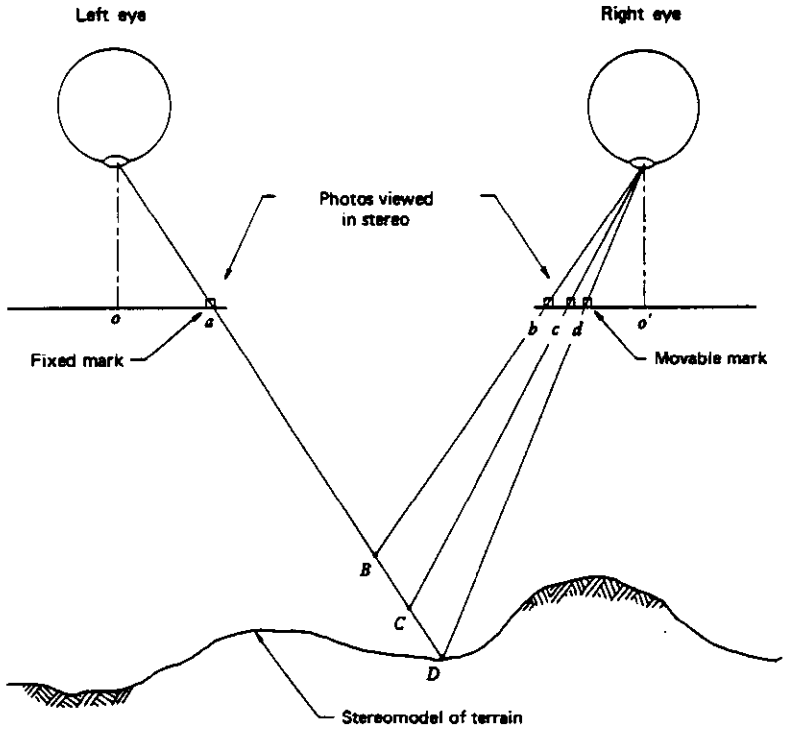


Figure 5

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6. Discuss the significance of atmospheric absorption and atmospheric windows on the selection of the optimum spectral bands in remote sensing (Figure 6).

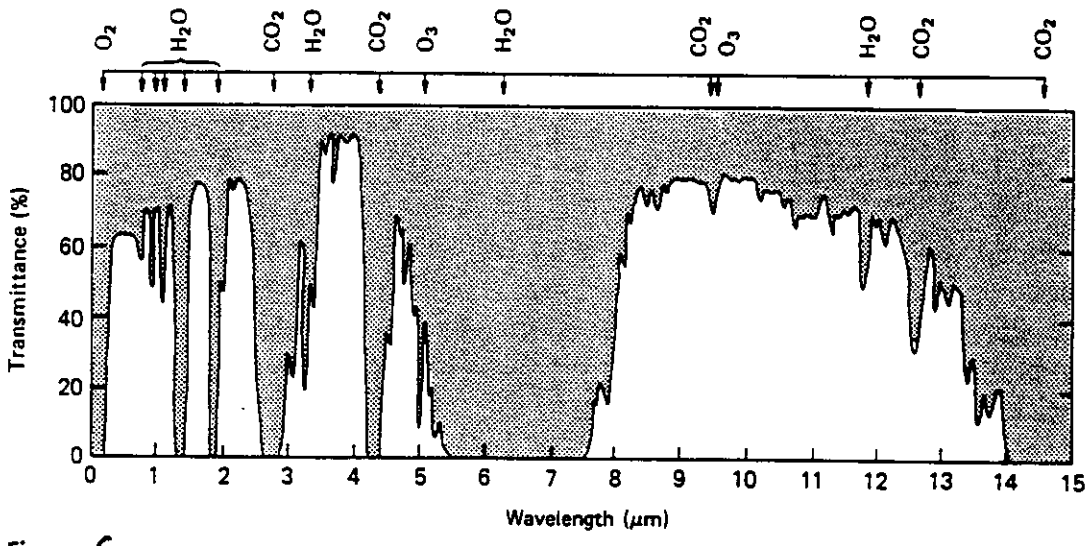

Figure 6

7. Explain how the satellites (Figure 7), when launched in sun-synchronous orbits, cover the Earth. And calculate how long does it take (in days) for a satellite, *orbiting the Earth 16 times a day with 20% overlap at the equator, and 100 km sensor swath*, to completely scan the Earth's surface. *Assume the equatorial circumference 40,000 km.*

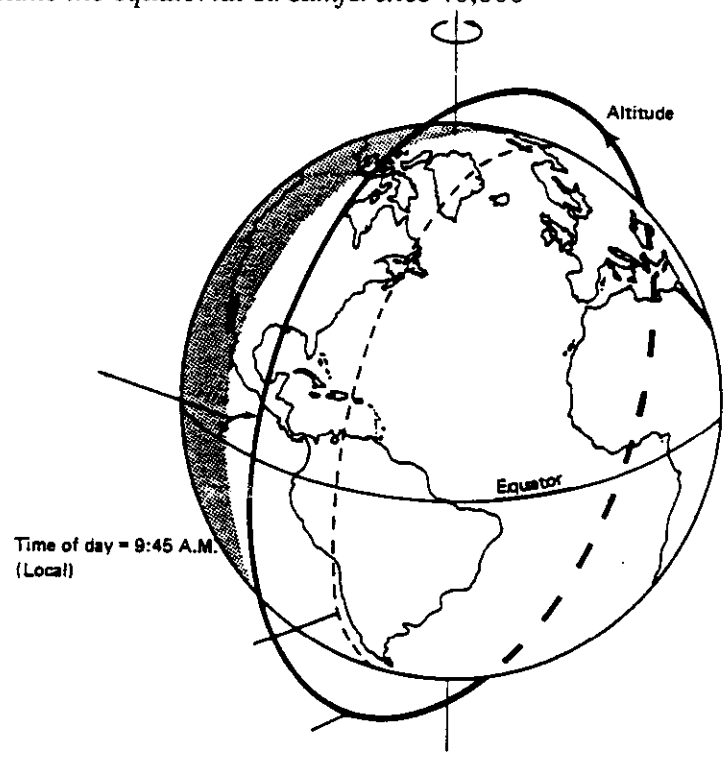

Figure 7

8. Using Figure 8 define the histogram and its significance in contrast manipulation.

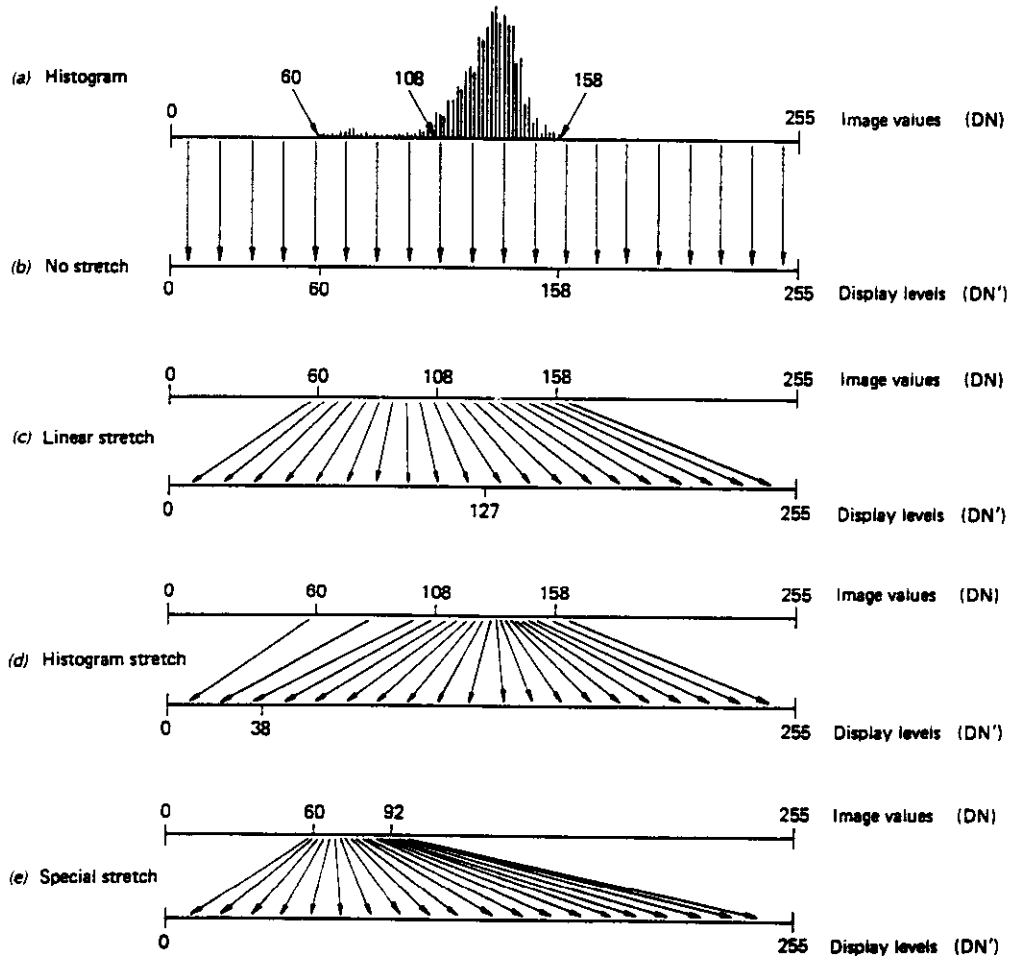

Figure 8

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