SRI LANKA SURVEY DEPARTMENT

Promotion Examination from Class II "A" to Class I of Sri Lanka
Technological Service Officers -2016
(For Remote Sensing Technological Officers)

Remote Sensing I

2016.09.29 Time: Three (03) hours 0900 – 1200 hours

Answer all Questions.

(1.) (a.) What do you mean by pre processing and post processing? (4marks)

(b.) What are the errors can be occurd in images? Explain. (4marks)

(c.) What are the reasons for errors? (2marks)

(d.) What are the systematic errors? (2marks)

(e.) Describe the source(s) of line striping in an image. (2marks)

(f.) Describe briefly the way line striping in an image can be corrected. (2marks)

(g.) Correct following missing line. (4marks)

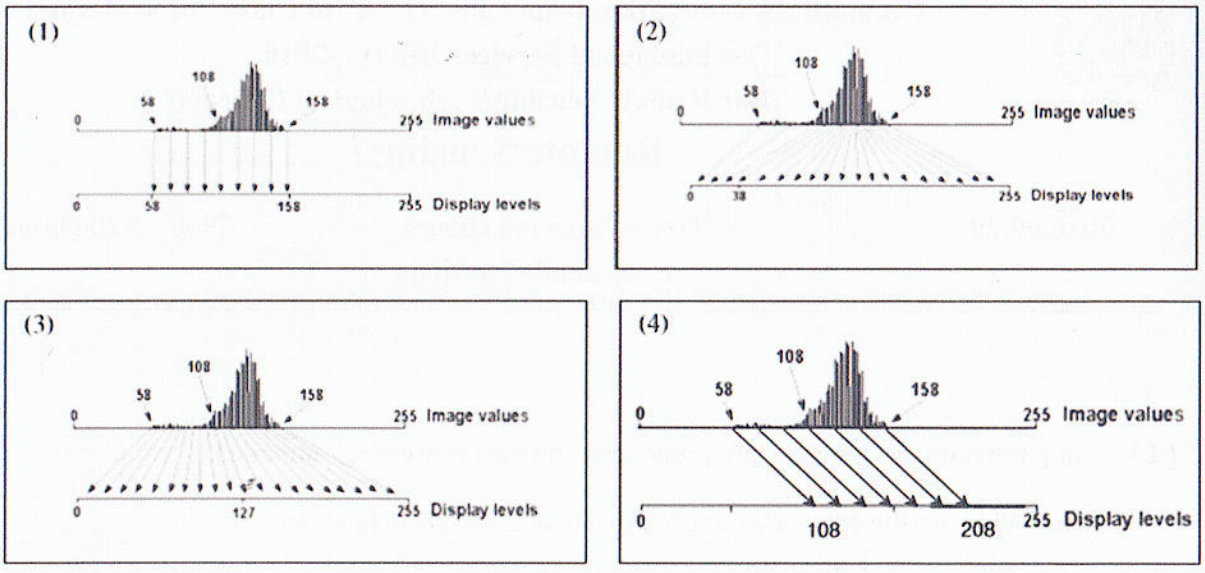
25	25	26	30	29	31
26	26	26	29	25	37
0	0	0	0	0	0
27	28	30	35	36	31
22	24	25	27	28	27

(2.)

(a.) What are the main steps of georeferencing an image? Describe the process in 3-6 steps. (5marks)

(b.) How can we assess whether the result is good enough? (3marks)

(c.) Histogram (1) was changed 3 times: in (2),(3) and (4) respectively, each time in a different way.



I.) Which of the changes does not improve the value range? (2marks)

II.) Which is a linear stretch? (2marks)

III.) What is changing as a result of (4)? (2marks)

(d.) Underline the correct answer.

(I.) Given the following kernel:

1/9	1/9	1/9
1/9	1/9	1/9
1/9	1/9	1/9

Applying this filter on an image will: (indicate one option)

(a.) Sharpen the horizontal edges

(b.) Sharpen the vertical edges

(c.) Smooth the image

(d.) Has no influence (2marks)

(II) Given the following kernel

0	0	0
0	1	0
0	0	0

Applying this filter on an image will: (indicate one option)

(a.) Sharpen the horizontal edges

(b.) Sharpen the vertical edges

(c.) Smooth the image

(d.) Has no influence (2marks)

(III) Given the following kernel

-1	-1	-1
2	2	2
-1	-1	-1

Applying this filter on an image will: (indicate one option)

(a.) Sharpen the horizontal edges

(b.) Sharpen the vertical edges

(c.) Smooth the image

(d.) Has no influence (2marks)

(3.)

(a.) Indicate with true (T) or false (F) the following statements:

(I.) With additive coloring, red and green results in yellow T or F (2marks)

(II.) The effect of applying an average filter is that the resulting image looks sharper T or F (2marks)

(III.) A kernel defines the output pixel value as a linear combination of pixel values in the neighborhood around the corresponding position in the input image. T or F (2marks)

(IV.) Stretching images of different years with histogram equalization results in images that are easy to compare for change detection T or F (2marks)

(b.) Give one advantage and one disadvantage of the off-nadir viewing capability of some optical earth observation satellites. (4marks)

(c.) You are requested to comment on a land use change map stating that over the last three years 15% of the land changed from one use to another. According to the author of the map, the following cloud-free images were used in preparing the map:

- ASTER image, 23 May 2000 (raw DN values) - ASTER image, 03 November 2003 (raw DN values, with several periodic line dropouts)

Write down the results of this change detections study can be attributed. (8marks)

(4.)

(a.) The following 6 land cover classes were classified in a satellite image. For validation, ground truth was collected at 200 sample points. The results of the validation are summarized in the following contingency matrix.

	Ground truth (reference from samples)						
Classified image	Pine trees	Maple trees	Grass	Bare	Buildings/ urban	Water	Total
Pine trees	16	11	2				29
Maple trees	9	14	4	1			29
Grass	1	3	30	2	1	3	40
Bare rock			3	20	3		26
Buildings/urban				3	35	1	39
Water			1	1	1	35	38
Total	26	28	40	27	40	39	200

(i.) Which are the most and least accurately classified classes? (4marks)

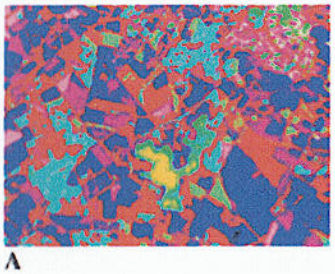
(ii.) Calculate: 1 . the overall accuracy: (2marks)

2 . the error of commission of the class Maple trees: (2marks)

3.the error of omission of the class grass: (2marks)

(b.) Indicate with a letter which picture or drawing is:

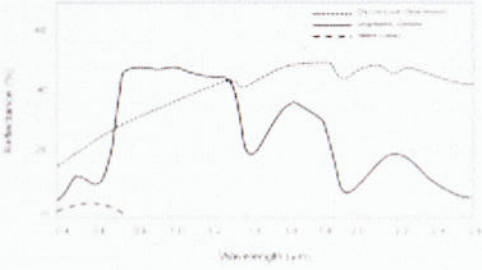
(i.) Feature space (or scatter) plot - (2marks)
(ii.) Classified image - (2marks)
(iii.)Histogram - (2marks)
(iv.) Single band of satellite image - (2marks)
(v.) Reflection curves - (2marks)



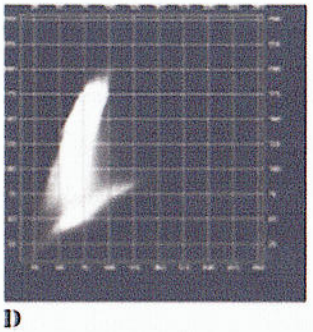
A



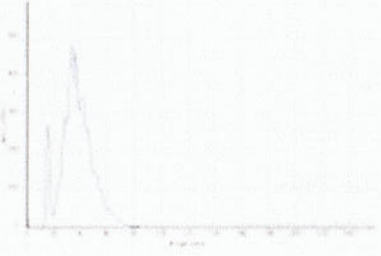
B



C



D



E

(5.) Explain briefly

a) Low pass filter (4marks)
b) High pass filter (4marks)
c) Edge detection filter (4marks)
d) Linear contrast stretch (4marks)
e) Histogram equalization (4marks)

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Remote Sensing II

2016.09.29 Time: Three (03) hours 1300 – 1600 hours

Answer all Questions.

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(1). (a) What are the Error Sources in Satellite based positioning in Remote Sensing?

(b) Point out the Causes of Geometric Distortion of Satellite Image.

(c) How do you Geo-reference Satellite image. (Steps)?

(d) What is "Image Fusion"?

(20 marks)

(2) (a) The features that our brains use when we interpret an image can be grouped into seven main elements. So what do you mean by this 'interpretation elements'?

(b) Scale is one important element out of seven elements. Maps are described as either large scale or small scale. For Urban mapping which scale level do you propose? Explain.

(c) "Land use cannot be determined from satellite imagery." Is this statement true or falls? Describe.

(d) What are the factors should be consider, depend on quality of an image interpretation?

(20 marks)

(3) (a) What is the objective of image classification in Remote Sensing?

(b) What do you mean by Supervised and Unsupervised classification in Image processing?

(c) Describe 'feature space' and 'Image space' in image classification.

(d) (i) What is accuracy assessment in image classification?

Land Cover Class	W	C	H	B	G	F	Row Total
W	**93**	0	2	1	0	0	**96**
C	0	**65**	4	6	0	0	**75**
H	2	3	**124**	5	9	12	**155**
B	2	3	21	**165**	24	12	**227**
G	0	0	6	16	**201**	45	**268**
F	0	0	8	9	76	**512**	**605**
	97	**71**	**165**	**202**	**310**	**581**	**1426**

(ii) Define the axes and calculate overall accuracy of final product using above error metrix.

(20 marks)

(4).

(a) What do you mean by process of Digitization and what is the difference between digitizing and Scanning?

(b) How do you describe raster data?

(c) Describe two types of data, '**Continues data**' and '**Discrete data**' in GIS and give examples.

(d) Explain importance of Vector Data over Raster data in GIS modelling.

(20 marks)

(5). (a) What do you mean by phenomenon in GIS environment?

(b) What are the three (03) main components in GIS, Describe?

(c) What is the primary difference between a GIS and a computer-generated map?

(d) Why have a GIS instead of using paper maps?

(e) What is a major bottleneck in application of GIS technology? Describe.

(f) Following which statement is applicable to compare, overlay or cross analysis of two maps in a GIS?

(i) Both maps must be in digital form

(ii) Both maps must be in the same map projection

(iii) Both maps must be in same coordinate system

(iv) all of the above (i), (ii) and (iii).

(20 marks)