

Agricultural and Food Engineering Department
I I T Kharagpur
Mid Autumn Semester Examination 2011

Course- First Year M. Tech (LWRE, & WM),) & RS (AgFE, GG, Civil, AR, WM)

Subject: Geo- informatics for Land & Water Resources (AG 60203)

Date of Examination: September 30, 2011 (A.N.)

No. of the Students: 32 (24+8)

Time: 2 hours

Max .Marks: 30

Instructions: All questions are **compulsory**. Assume reasonable data if not available in question.
 Question paper consists of **2** pages.

Q-1	<p>A) Schematically illustrate the generalized processes and elements involved in electromagnetic remote sensing of earth resources.</p> <p>B) What should be the "ground resolution cell" for the sensors with Instantaneous Field of View i) 40 micro radian, ii)80 micro radian with a platform height of 904 km.</p> <p>C) Show that the maximum radiant exitant from earth surface occurs at 9.7 μm.</p>	3+1+1																																								
Q-2	<p>A) Characterize a remote sensor used in a Satellite. Give brief descriptions of these characteristics.</p> <p>B) Imagine that we have a 6 pixels (3 columns and 2 rows), with 3 bands gray level values as given below:</p> <table border="1" style="margin: 10px auto; border-collapse: collapse;"> <tbody> <tr> <td style="padding: 2px 5px;">B-1</td> <td style="padding: 2px 5px;">56</td> <td style="padding: 2px 5px;">58</td> <td style="padding: 2px 5px;">62</td> <td style="padding: 2px 5px;">B-2</td> <td style="padding: 2px 5px;">69</td> <td style="padding: 2px 5px;">82</td> <td style="padding: 2px 5px;">94</td> <td style="padding: 2px 5px;">B-3</td> <td style="padding: 2px 5px;">134</td> <td style="padding: 2px 5px;">135</td> <td style="padding: 2px 5px;">139</td> </tr> <tr> <td></td> <td style="padding: 2px 5px;">148</td> <td style="padding: 2px 5px;">197</td> <td style="padding: 2px 5px;">152</td> <td></td> <td style="padding: 2px 5px;">156</td> <td style="padding: 2px 5px;">157</td> <td style="padding: 2px 5px;">143</td> <td></td> <td style="padding: 2px 5px;">120</td> <td style="padding: 2px 5px;">172</td> <td style="padding: 2px 5px;">184</td> </tr> </tbody> </table> <p>Prepare a table showing storage of these data in BSQ, BIL and BIP format.</p>	B-1	56	58	62	B-2	69	82	94	B-3	134	135	139		148	197	152		156	157	143		120	172	184	2+3																
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	148	197	152		156	157	143		120	172	184																															
Q-3	<p>A) The thematic band of LANDSAT has following wavelengths. Write the names and characteristics as well as uses of these bands. B-1: 0.45-0.52 μm, B-2: 0.52-0.60 μm, B-3: 0.62-0.69 μm, B-4:0.76-0.90 μm, B-5:1.55-1.75 μm, B-6:10.4-12.5 μm, B-7: 2.08-2.35 μm.</p> <p>B) i) What is a digital image? ii) Explain a simple image formation mathematical model. iii) Write M x N numerical array of a digital image.</p>	2+3																																								
Q-4	<p>A) Draw typical spectral reflectance curves for i) Vegetation ii) Dry brown color soil iii) water.</p> <p>B) Briefly explain the purpose of image enhancement.</p> <p>C) A sample data image and 3x3 convolution kernel are shown below- Determine the convolved centre pixel value of sample data set.</p> <table style="margin: 10px auto;"> <tbody> <tr> <td style="padding: 2px 5px;">2</td><td style="padding: 2px 5px;">8</td><td style="padding: 2px 5px;">6</td><td style="padding: 2px 5px;">8</td><td style="padding: 2px 5px;">8</td> <td style="padding: 2px 5px;">-1</td><td style="padding: 2px 5px;">-1</td><td style="padding: 2px 5px;">-1</td> </tr> <tr> <td style="padding: 2px 5px;">6</td><td style="padding: 2px 5px;">8</td><td style="padding: 2px 5px;">6</td><td style="padding: 2px 5px;">6</td><td style="padding: 2px 5px;">6</td> <td style="padding: 2px 5px;">-1</td><td style="padding: 2px 5px;">16</td><td style="padding: 2px 5px;">-1</td> </tr> <tr> <td style="padding: 2px 5px;">8</td><td style="padding: 2px 5px;">2</td><td style="padding: 2px 5px;">8</td><td style="padding: 2px 5px;">6</td><td style="padding: 2px 5px;">6</td> <td style="padding: 2px 5px;">-1</td><td style="padding: 2px 5px;">-1</td><td style="padding: 2px 5px;">-1</td> </tr> <tr> <td style="padding: 2px 5px;">2</td><td style="padding: 2px 5px;">2</td><td style="padding: 2px 5px;">2</td><td style="padding: 2px 5px;">8</td><td style="padding: 2px 5px;">6</td> <td colspan="3"></td> </tr> <tr> <td style="padding: 2px 5px;">8</td><td style="padding: 2px 5px;">8</td><td style="padding: 2px 5px;">6</td><td style="padding: 2px 5px;">2</td><td style="padding: 2px 5px;">8</td> <td colspan="3"></td> </tr> </tbody> </table> <p style="text-align: center; margin-top: 10px;">Kernel</p>	2	8	6	8	8	-1	-1	-1	6	8	6	6	6	-1	16	-1	8	2	8	6	6	-1	-1	-1	2	2	2	8	6				8	8	6	2	8				1+2+2
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8	8	6	2	8																																						

Data

Continuation Page 2

Q-5 A) From the following contingency table, Compute

3+2

i) Commission error, ii) Omission error, and iii) Overall accuracy.

Reference data set			
Classified	Forest	Water	Urban
Forest	28	14	15
Water	1	15	5
Urban	1	1	20

B) List different types of spectral indices and their use.

Q-6 Write physical significance of the following (Answer should not be more than three lines):

1x5

- i) Spectral reflectance of vegetation at 1.4, 1.9 and 2.7 μm .
- ii) B G R colour composite is replaced with B G IR.
- iii) Appearance of clear sky as blue.
- iv) Micro and radar wave has lower energy content than Visible or IR.
- v) Which parameter of image data makes poor fitting of training data in the rectangular decision regions(parallelepiped classification)?