FACULTY OF SCIENCE

DEPARTMENT OF GEOGRAPHY, ENVIRONMENTAL MANAGEMENT & ENERGY STUDIES

MODULE	**GGR 0067/GGFRSI7/GGR8X67** Geo-Informatics 2: Remote Sensing
CAMPUS	**APK**
EXAM	**NOVEMBER 2015**

DATE   3 NOVEMBER 2015   **SESSION**   08:30 – 11:30

ASSESSOR(S)   **DR. S. TESFAMICHAEL**

EXTERNAL MODERATOR   **DR E. ADAM**
                                          (WITS)

DURATION   3 HOURS   **MARKS   100**

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NUMBER OF PAGES: 4 PAGES

Instructions:

1. Answer any **FOUR** questions

1. Bush encroachment is one of the main factors that affect most savanna ecologies. Discuss a remote sensing and time-series analysis approach to assess the extent of bush encroachment at the landscape level within a given municipality. Use the following aspects in your discussion.

   - Data selection criteria
   - Temporal extent and resolution
   - Seasonality
   - Data analysis methods
   - Accuracy assessment

   [25]

2.
   (i) Analysis of hyperspectral remote sensing data requires an advanced data processing techniques that enables accurate spectral characterization of features. Critically discuss the procedures to classify or map the following features using hyperspectral remote sensing data.

   (15)

   - Soil type
   - Forest type
   - Grass species

   (ii) Discuss in detail the difference between object-based and pixel-based image classification.

   (10)

   [25]

3. Land use/land cover change is an important topic in the debate concerning global climate change and/or variability. Discuss the role of remote sensing in assessing land use/land cover change by focusing on the following advantages.

   - Cost effectiveness
   - Spatial coverage
   - Timeliness of data
   - Long-term data availability
   - Objectivity

   [25]

4.
   (i) Explain in detail the principle of lidar remote sensing.

(5)

   (ii) Discuss the application of lidar in the following areas of interest.

- Vegetation biomass assessment
- Urban structural characterization

(20)

[25]

5. The Klipriviersberg Nature Reserve in Johannesburg is under threat from alien plant species. Discuss how remote sensing can be employed to map and monitor the distribution of selected alien species in the reserve. Your discussion must include and justify the following:

- Data selection
- Data analysis method
- Accuracy assessment
- Monitoring plan

[25]

6. Assume that a vegetation cover classification has been performed using Landsat imagery. Subsequently, an accuracy assessment was conducted to evaluate the success of the classification. The following are observations of the evaluation process.

- Out of 30 000 open canopy forest pixels, 22 000 were classified correctly as open canopy forest, 4 500 as grassland, and 3 500 as bushland.

- Out of 40 000 grassland pixels, 35 000 were classified correctly as grassland, 2000 as open canopy forest, and 3 000 as bushland.

- Out of 30 000 bushland pixels, 23 000 were classified correctly as bushland, 4 500 as grassland, and 2 500 as open canopy forest.

   - Construct an error matrix depicting the above results.
   - Calculate the overall producer's and user's accuracy levels.
   - Describe the accuracies.
   - Discuss <u>three</u> reasons why the accuracy levels were not better.

[25]

7. Suppose the Department of Forestry and Fisheries intends to assess deforestation and forest degradation in the Eastern Cape Province over the past 40 years. Discuss a remote sensing approach to achieve this objective. Use the following aspects in your discussions:

- Data selection
- Data analysis method
- Accuracy assessment
- Temporal resolution

[25]

TOTAL [100]

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