

**UNIVERSITY OF KWAZULU-NATAL, DURBAN CENTRE**  
**EXAMINATION: MAY 2011**

**SCHOOL : ENVIRONMENTAL SCIENCES**  
**LEVEL : III**  
**MODULE : SOIL EROSION AND LAND DEGRADATION**  
**CODE : ENVS315W1**

**DURATION: 3 HOURS**

**TOTAL MARKS: 300**

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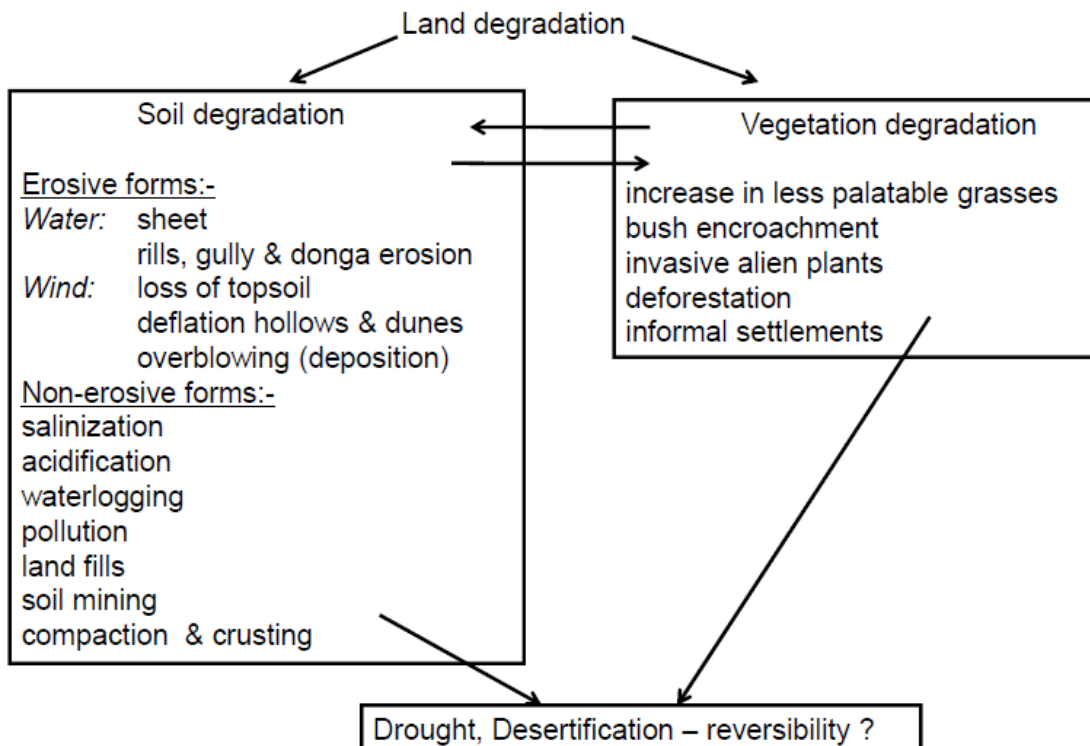
**INTERNAL EXAMINER: DR HK WATSON**  
**EXTERNAL EXAMINER: PROF S. GRAB**  
**UNIVERSITY OF WITWATERSRAND**

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**INSTRUCTIONS: ANSWER THREE QUESTIONS**  
**ALL QUESTIONS CARRY EQUAL MARKS**  
**WHERE APPROPRIATE, USE DIAGRAMS AND GIVE**  
**EXAMPLES**

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1. Define land degradation and then briefly describe each of its forms represented in the diagram below. Comment on the direct and indirect links between these forms, their significance in terms of the spatial extent affected, and the challenge of reversing them in the national context.



2. Provide examples that demonstrate the value of Erosion Hazard Assessment as a ‘tool’ over a range of different spatial scales.
3. Explain why soil conservation strategies are required to ameliorate both the on- and off-site effects of erosion.
4. Explain why southern African soils are inherently not suitable for cultivation.
5. “Soil erodibility - the susceptibility of soil to erosion - is a critical parameter in soil loss analysis. Yet it is a complex variable, not only because it depends on other soil characteristics, but also because it varies with time and other conditions”. (Garland, Hoffmann, and Todd, 1999, pg. 86). Critically discuss this statement.
6. Describe the mechanics of the wide range of surface and subsurface processes responsible for the formation of gullies.

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SUPPLEMENTARY EXAMINATION: JUNE 2011**

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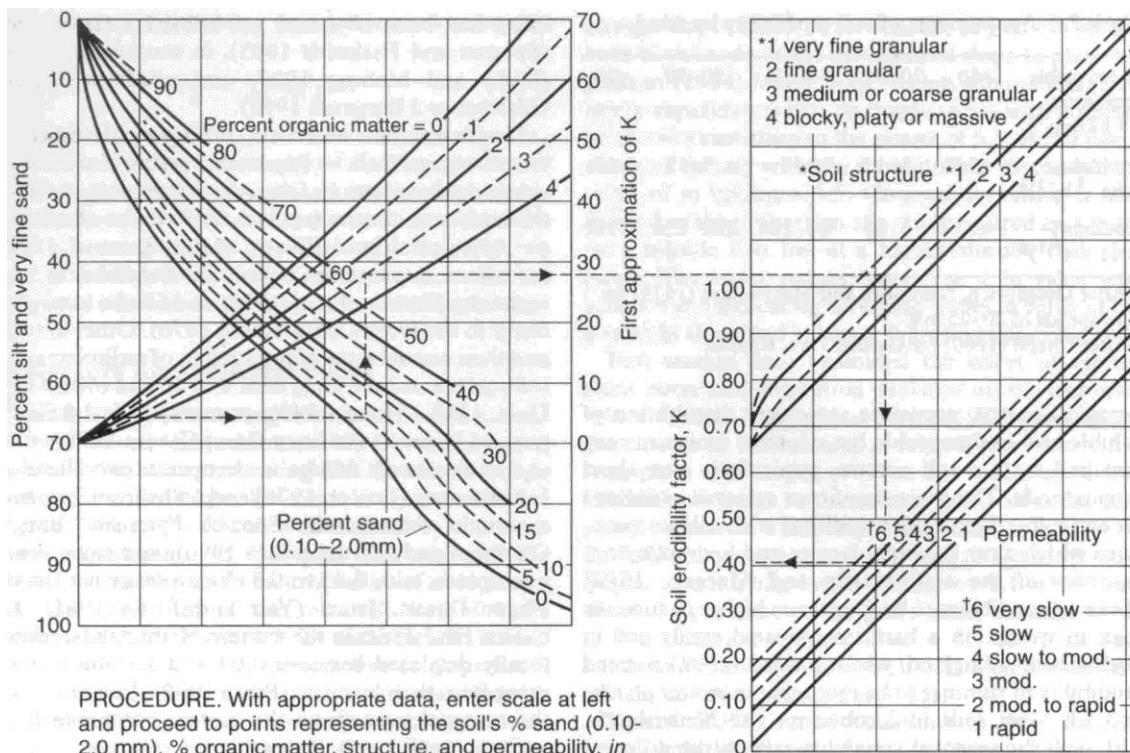
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1. Explain the origin, the basis for the inputs into, and the reliability of the diagram shown below.



PROCEDURE. With appropriate data, enter scale at left and proceed to points representing the soil's % sand (0.10-2.0 mm). % organic matter, structure, and permeability, in that sequence. Interpolate between plotted curves. The dotted line illustrates procedure for a soil having: sf + vfs 65%, sand 5%, OM 2.8%, structure 2, permeability 4. Solution:  $K = 0.41$ .

2. A number of rainfall parameters interact to determine its erosivity. Discuss the basis of indices that have been developed to capture their net influence.
3. Discuss the assertion that soil erosion cannot be adequately described merely by multiplying together six factor values because there is considerable interdependence between the variables contributing to these factors.
4. Describe the mechanics of the detachment and transport of sediment particles by unconfined (sheet) and confined (rill) overland flow.
5. “A combination of historical and geomorphological analysis emphasizes that erosion is a natural process but that its rate and spatial and temporal distribution depends on the interaction of physical and human circumstances” (Morgan, 1995, pg 27). Critically discuss this statement.
6. Cooper’s (1999) chronological review of factors affecting South Africans’ perception of erosion and of their willingness to implement soil conservation measures, led her to conclude that the country’s soil conservation policy environment has been shaped and characterized by a number of factors. Provide a critical overview of these factors.