

National Exams May 2011

04-For-A3, Forest Soils

3 hours duration, 5 Pages, 27 Questions – 100 Marks

NOTES:

1. If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper, a clear statement of any assumptions made.
2. This is a CLOSED BOOK EXAM.
A Casio or Sharp approved calculator is permitted.
3. TWENTY-SEVEN (27) questions constitute a complete exam paper.
4. Value of questions vary, weights for each question indicated in brackets.
5. Most questions require an answer in short-answer format, and should be answered singularly, or in multiple parts as indicated by how the question reads. Clarity and organization of the answer is important. Longer answers may require additional space, and can be written on additional paper or an exam booklet (and submitted along with exam paper).

04-For-A3, Forest Soils

- Examination Questions -

1. Define "soil" and "regolith". How are they different? (4)
2. Define "eluviation". How does this process differ from "biomixing"? (4)
3. What are "acid cations" and "exchangeable base cations"? (4)
4. How is extent of soil weathering related to soil acidity (pH)? (3)
5. From ridge-top to valley-bottom: soil pH typically increases, decreases, or stays the same? Explain. (4)
6. Define "soil base saturation". How is soil pH related to soil base saturation? (4)

7. How does soil organic matter build-up on soil in the form of forest litter, and how does this affect soil acidity? (4)

8. Distinguish igneous basalt from sedimentary siltstone in terms of soil forming materials. Which material will generate a "better" soil in terms of soil nutrient (Ca, Mg, K) content? (4)

9. Under what field conditions (topography, vegetation, drainage, climate) might we find the following soil horizons? General short answer. (7)

"Ah" horizon –

"Ae" horizon –

"Ap" horizon –

"Bf" horizon –

"Bg" horizon –

"Bm" horizon –

"BCx" horizon –

10. Under what field conditions (topography, vegetation, drainage, climate) might we expect to find a soil profile with the following horizon sequence: (5)

L, F, H, Ae, Bfc, BC, Cx

11. How does a soil horizon develop into a "hardpan" or "fragipan" condition? (3)

12. Describe how soil colour can be used to as a visual indicator to identify other soil properties. (4)

13. Define: "Mor", and "Mull" organic forest-floor horizon types. (3)

14. How would a lack of organic matter affect soil bulk density? Explain. (4)

15. Describe how soil bulk density affects plant growth. (3)

16. Explain how coarse fragment content relates to soil mechanical strength, and its effects on plant / tree rooting and growth. (4)

17. Distinguish: "Gravel", and "Mineral". (2)

18. Distinguish a "Podzolic" soil from a "Brunisolic" soil type. (2)

19. Distinguish a "Regosolic" soil from a "Gleysolic" soil type. (2)

20. Name and describe four (4) depositional landforms in a glaciated landscape. (4)

21. What soil profile would you expect to encounter in an imperfectly drained alluvial soil, subject to periodic inundation with flood water? Explain. (4)

22. What soil profile would you expect to encounter under mixedwood (coniferous / deciduous) forest cover, on well drained ablation till, on top of a granitic hill? Explain. (4)

23. If a soil that is 50cm deep, has a soil bulk density (D_b) of 1.3g/cm^3 , how much does it weigh per hectare ($10,000\text{ m}^2$) when air-dry? What does it weigh when wet, if it has a moisture content of 50%? (4)

24. What are the two soil conditions / attributes that form the basis for forest site classification? Explain. (4)

25. What soil attributes are used to decide on soil drainage conditions? (4)

26. Why is soil permeability important to soil quality? Explain. (4)

27. Which soil texture has a higher sand content? Sandy Loam or Loamy Sand? (2)