

UNIVERSITY OF PRETORIA  
DEPARTMENT OF GEOLOGY  
ENGINEERING GEOLOGY GLY363

EXAMINATION MEMO: JUNE 2008

Examiners: Internal: Prof J L van Rooy  
External: Mr D H Wessels

Time: 90min  
Marks: 70

ANSWER ALL THE QUESTIONS / *BEANTWOORD AL DIE VRAE*

QUESTION 1

Explain how the mode of transport of the following transported soils as well as the climate may influence their engineering geological properties:

- 1.1 Colluvium (9)  
1.2 Alluvium (7)  
1.3 Aeolian soils (4)

Transported Soil	Climate	Transport medium	Eng Geology
Colluvium Coarse	N<5 N > 5	Gravity – unsorted, coarse, slightly changed matrix. Gravity – unsorted, coarse.	Slope instability
Colluvium Fine	N<5 N>5	Gravity & water Gravity & Wind	Heave, collapse, compressibility, dispersive
Alluvium	N<5 N>5	Rivers – flooding, sand, clay, silt Alluvial fans – gravels & sand	Active clays, high perm. Flooding
Aeolian	N>5	Wind strength – sand, silt, not weathered particles	Mobile Loose Collapsible, compressible

[20]

QUESTION 2

List the typical mode of slope failure that may be expected in the following soils/rocks and explain the reasons for this failure mode:

Material	Mode of failure (1)	Reasons (2)
2.1 Residual granite Nelspruit	Soil slump	Deep weathering saturation
2.2 Pietermaritzburg shale	Translational slide	Bedding planes dip seaward Weathering to clay on planes
2.3 Strubenkop shale	Translational slide	Smooth bedding planes, undercutting
2.4 Table Mountain sandstone	Wedge failures	Folded, blocky, phyllite
2.5 Drakensberg basalt	Toppling, sliding	Vertical jointing, vertical cliff faces, stress release joints

[15]

QUESTION 3

A road must be constructed between Bela Bela and Pretoria. Describe the expected soil profile on each bedrock type encountered along the road centerline and give your opinion on the foundation conditions in the different surficial materials and the suitability of the different materials in the soil profile for possible use in highway construction.

The rock types occurring along the centerline are:

Bedrock	Profile	Foundation	Construction
Rooiberg felsite 6	Thin silty sand Weath rock	Sound	Sound – soil & rock
Karoo basalt 4	Thick black clay Weathered bedrock	Heave – problems	Not
Lebowa granite 6	Thin silty sand ferricrete Weathered bedrock	Sound – perched groundwater	Sound – all
Karoo sandstone & shale 6	Deep clayey sand Ferricrete Weathered bedrock	SSt – sound, compressible Shale – clay, weak Perched gw	Not – fine grained
Magaliesberg quartzite 4	Thin collapsible sand Bedrock	Sound – excavation, slopes	Sound
Marico diabase 4	Clay Weathered bedrock	Heave – problems	Not
Silverton shale 5	Thick silty clay ferricrete Weathered shale	Inactive clay – weak perched	Not, sometimes the shale.

[35]

TOTAL: [70]