



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF INDUSTRIAL TECHNOLOGY

DEPARTMENT OF CIVIL AND WATER ENGINEERING

TRANSPORTATION ENGINEERING & PLANNING I

TCW 3105

Supplementary Examinations Paper

JULY 2016

This examination paper consists of 3 pages

Time Allowed: 3 Hours

Total Marks: 100

Examiner's Name: T.C. Mdlongwa

INSTRUCTIONS

1. Answer all questions.
2. Each question carries 25marks.
3. Use of calculators is permissible

MARK ALLOCATION

QUESTION	MARKS
1.	25
2.	25
3.	25
4.	25
TOTAL	100

QUESTION 1.

- a) List the major disciplines of transportation engineering and briefly discuss each one of the disciplines. [8marks]
- b) Classify the different roles of transportation and discuss the importance of each. [8marks]
- c) Define the following terms in relation to transportation engineering:
i. Average daily traffic (ADT),
ii. Annual average daily traffic (AADT),
iii. Reaction Time,
iv. Right of Way (ROW), provide neat sketch. [5marks]
- d) Equally important as the consideration of horizontal alignment is that of the facility's vertical alignment. List at least four factors that influence the vertical alignment of highways. [4marks]

QUESTION 2.

- a) The following VPI's are on a road:

VPI	SV (m)	Level (m)
1	330	141.8
2	720	158.6
3	1200	161.2

Given that curve length is 200m at VPI 2, calculate the levels on the curve at 20m intervals

[14marks]

- b) A horizontal curve is designed with a 600 m radius and is known to have a tangent length of 52 m. The PI is at station 200+00. Determine the stationing of the PT.
NOTE: [100m stations are used] [8marks]
- c) Distinguish between the terms mobility and accessibility citing appropriate examples in each case. Provide a sketch as part of your solution. [3 marks]

QUESTION 3.

- a) What is a pavement? [1mark]
- b) What are the functions of a pavement? [4marks]
- c)
- d) Draw a typical flexible pavement structure and identify each layer which plays a role in carrying the traffic loads. [5marks]
- e) For a rural road located in Matabeleland North Province the following information is available for the design of a flexible pavement:

AADT	2400
Directional split (2-way DF)	50/50
Traffic Growth Rate	2%
Proportion of Heavy Vehicles	15%
Average Weight of Heavy Vehicle	1.5ESA's
Design Life	15years
Subgrade Strength, CBR	3.5%

Determine the pavement structure. Draw the pavement structure if a 30mm thick Hot Mix Asphalt surface course is to be provided.

[15marks]

QUESTION 4.

- a) List and define three sight distances as discussed during the lectures. Use sketches where necessary. [7marks]
- b) Show that the Stopping Sight Distance (SSD) is given by the equation

$$SSD = v \cdot t + \frac{v^2}{2gf}$$

Define each of the characters in the equations, giving their units of measurement.

[8marks]

- c) A driver of a vehicle applied brakes and barely avoided hitting an obstacle on a roadway. The vehicle left skid marks of 53m (Hint: skid marks indicating the distance moved in stopping vehicle in this scenario). Assuming $f=0.35$, determine whether the driver was in violation of the 60km/h speed limit at the location if he was travelling on level roadway. [6marks]
- d) Give at least four (4) considerations and factors influencing the horizontal and vertical alignment for a highway. [4marks]

END OF EXAMINATION PAPER

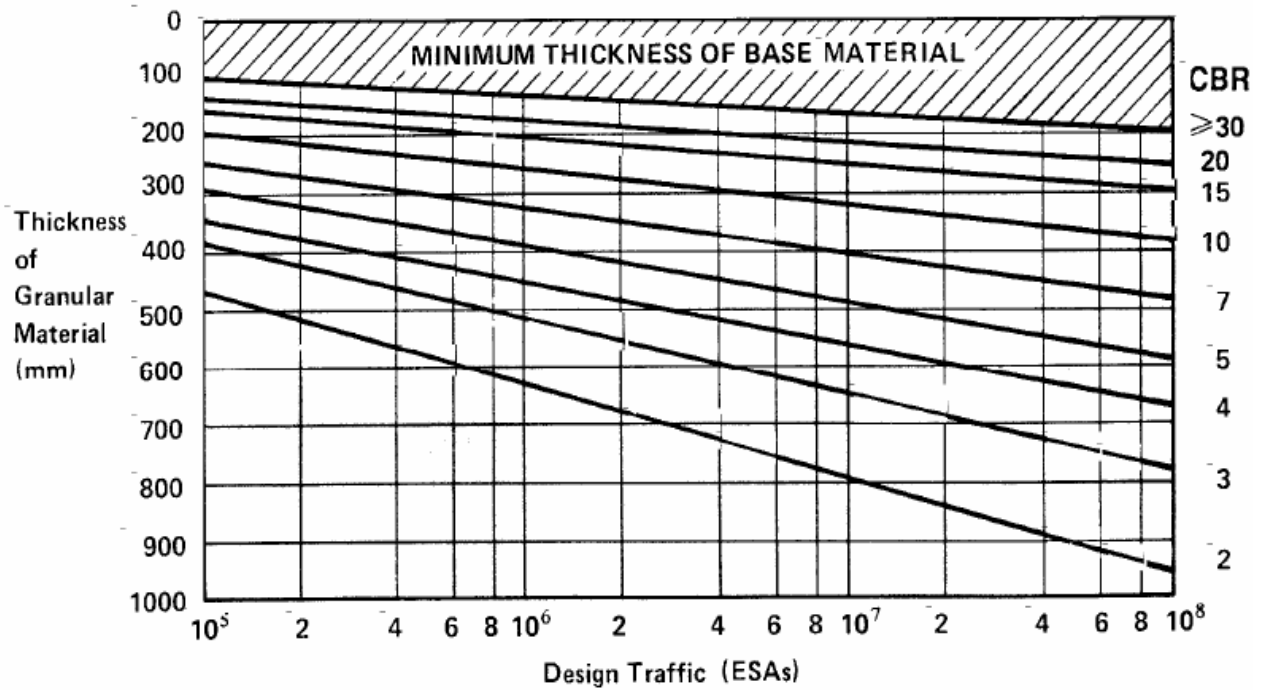
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ADDITIONAL INFORMATION FOR STUDENTS

$$N_{DT} = 365 \times AADT \times DF \times \% \frac{HV}{100} \times LDF \times CGF \times N_{HVAG}$$

$$CGF = \frac{(1 - 0.01R)^P - 1}{0.01}$$



DESIGN CHART FOR GRANULAR PAVEMENTS WITH THIN BITUMINOUS SURFACING