



TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF ENGINEERING AND TECHNOLOGY
Department of BUILDING & Civil engineering
UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN CIVIL ENGINEERING
TCV 4312 : TRAFFIC ENGINEERING I

END OF SEMESTER EXAMINATION
SERIES: AUG 2024
TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **five** questions.

Attempt question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

QUESTION ONE (COMPULSORY) (30 Marks)

a) What are the objectives of traffic volume count? And discuss various traffic studies
(5 marks)

b) Discuss the Moving observer method of carrying out measurement of traffic parameters (5 Marks)

c) i) Differentiate between Capacity and Level of Service. (2 Marks)

ii) State **FOUR** factors which affect the Level of Service for a particular type of facility (5 marks)

d) Briefly discuss Speed-Flow-Density Relationship (3 Marks)

ANSWER ANY TWO QUESTIONS FROM THIS SECTION

QUESTION TWO (20 Marks)



- a) State any **FIVE** functions of National Transport and Safety Authority (NTSA) of Kenya in relation to traffic engineering. (5 Marks)
- b) Illustrating with sketches, describe the relationship between
- (i) Traffic flow and density
 - (ii) Speed and traffic flow
 - (iii) Density and speed (6 marks)
- c) Using Greenshields model, show that for maximum flow velocity is given by half the free mean speed and density is given by half the jam density (9 marks)

QUESTION THREE (20 Marks)

- a) A timer began 0.00 seconds counting and continued for 25 seconds. The times at which the front end of the vehicles pass observation point A-A' are noted as follows:

Vehicle	Passing time
4	3.0
5	5.2
6	8.6
7	12.1
8	15.5
9	18.2

What are the individual headways and average headway? (4 marks)

- b) Define the following terms as used in traffic studies
- (i) Free flow speed
 - (ii) Average Daily Traffic (ADT)
 - (iii) Passenger Car Unit (PCU) (3 marks)

c). Studies have shown that the traffic flow on a single-lane approach to a signalized intersection can be described by the Greenshields model. If the jam density on the approach is 130 veh/km, determine the velocity of the stopping wave when the approach signal changes to red if the density on the approach is 45 veh/km and the space mean speed is 40 km/h. at the end of the red interval, what length of the approach upstream from the stop line will be affected if the red interval is 35 seconds? (9 marks)

d) State **FOUR** principles of signing in order to achieve the greatest efficiency of usage from traffic signs (4 marks)

QUESTION FOUR (20 Marks)

a) By giving examples, highlight four factors that affect capacity of a highway.

(6

marks)

b) One of the major aspects of new Constitution is to devolve resources from National Government to County levels. This has resulted to tremendous vehicular traffic growth rate especially in County headquarters and has coupled with traffic management challenges to the County Government. You have been appointed to be Chief Executive Officer in charge of infrastructure development in one of the 47 Counties and one of the major tasks assigned is to advise the County Government the possible strategies that can be implemented in order to improve traffic flow, reduce fuel consumption and improve road safety. Illustrating with sketches, describe any four important traffic management measures that you can advice County Government to adopt in order to improve its transportation in urban areas.

(10

marks)

c) Differentiate between Point-pricing systems and Continuous pricing systems

(4

marks)

QUESTION FIVE (20 Marks)

- a) The southbound approach of a signalized intersection carries a flow of 1000 veh/h/ln at a velocity of 50 mi/h. The duration of the red signal indication for this approach is 15 sec. If the saturation flow is 2000 veh/h/ln with a density of 75 veh/ln, the jam density is 150 veh/mi, determine the following:
- i) The length of the queue at the end of the red phase
 - ii) The maximum queue length
 - iii) The time it takes for the queue to dissipate after the end of the red indication.

(12

marks)

- b) A study of freeway flow at a particular site has resulted in a calibrated speed-density relationship, as follows:

$$U_s = 57.5(1 - 0.008k)$$

From this relationship:

- a. Find the free-flow speed and jam density
- b. Derive the equations describing flow versus speed and flow versus density.
- c. Determine the capacity of the site mathematically

(8 marks)