



MACHAKOS UNIVERSITY

University Examinations for 2021/2022 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

FOURTH YEAR FIRST SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (CIVIL ENGINEERING)

ECV 400: TRAFFIC ENGINEERING I

DATE: 25/8/2022

TIME: 11.00-1.00 PM

INSTRUCTIONS:

- This paper comprises of FIVE questions. Answer **THREE** questions
- Question one is **compulsory** and carry 30 marks
- Answer any other **TWO** questions

QUESTION ONE (30 MARKS)

- a) 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:

- Find the free-flow speed and jam density (4 marks)
 - Derive the equations describing flow versus speed and flow versus density. (4 marks)
 - Determine the capacity of the site mathematically (4 marks)
- b) Inspection of a freeway data set reveals a free flow speed of 60 mph, a jam density of 180 vehicles per kilometre per lane, and an observed maximum flow of 2000 vehicles per hour. From these observations
- Determine the linear equation for velocity for these conditions (4 marks)
 - Determine the speed and density at maximum flow conditions. (4 marks)
 - How do the theoretical and observed conditions compare? (2 marks)
- c)
- Discuss two types of traffic Flow (4 marks)
 - State four major objectives of Traffic management in the Kenya. (4 marks)

QUESTION TWO (20 MARKS)

- a) Using relevant diagram discuss traffic Flow densities (8 marks)
- b) Using relevant equations, discuss the following Traffic flow parameters
- i. Time mean speed
 - ii. Space mean speed (8 marks)
- c) If the speed of vehicle on Thika road is 120km/hr while the flow is 500 Veh/hr, calculate the traffic density on this road (4 marks)

QUESTION THREE (20 MARKS)

- a) Thika Superhighway has four lanes in each direction. The Thika bound capacity is 8200 veh/hr/lane and the free-flow speed is 65 mph.
- i. What is the maximum flow rate, maximum density, jam density? (6 marks)
 - ii. If a one-hour vehicle count in the Thika bound direction for the outside lane gives 7034 vehicles in a non-congested condition, what is the estimated space mean speed of these 7034 vehicles? (6 marks)
- b) Briefly discuss four road furniture used on Thika super highway. (8 marks)

QUESTION FOUR (20 MARKS)

Discuss the role of the Kenya Traffic police in the traffic management in Kenya.

QUESTION FIVE (20 MARKS)

- a) Define the term Traffic signs as used in traffic Engineering (2 marks)
- b) Discuss three types of traffic signs used in Kenya (12 marks)
- c) Using relevant equations discuss Speed-Flow-Density Relationship (6 marks)