TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR

BACHELOR OF SCIENCE IN CIVIL ENGINEERING

TCV 4312 / ECV 4414: TRAFFIC ENGINEERING I

END OF SEMESTER EXAMINATION

SERIES: JANUARY 2025

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination: Answer Booklet, Drawing Instruments, Scientific calculator, examination pass and student ID.

This paper consists of five questions. Attempt question ONE (Compulsory) and any other TWO questions. All diagrams should be clearly drawn and labeled.

USE OF MOBILE PHONES & PROGRAMMABLE CALCULATORS IS NOT ALLOWED.

Each question should be on a fresh page of the answer booklet.

Question One (Compulsory)

(a) What is 'Traffic Engineering'? What roles does Traffic Engineering play as a discipline? (3 marks)

(b) Discuss the concept of 'Shock Waves' and clearly explain how 'Positive' and 'Negative' shock waves do occur. (7 marks)

(c) Briefly describe how the following driver characteristics influence the rate at which accidents occur:

i. Vision

ii. Field of vision

iii. Fatigue (9 marks)

(d) A student riding his bicycle from campus on a one-way street takes 50 minutes to get home, of which 10 minutes was taken talking to the driver of a stalled vehicle. He counted 42 vehicles while he rode his bicycle and 35 vehicles while he stopped. What are the travel time and flow of the vehicle stream? (6 marks)

(e) What is a 'time – space' diagram? Draw a clearly labeled time-space diagram. (5 marks)

QUESTION TWO

(a) i. What is 'space mean speed'? (1 mark)

ii. Show the fundamental equation of traffic flow explaining each element of the equation. (2 marks)

(b) The relation between flow and density, density and speed, speed and flow, can be represented with the help of some curves referred to as the 'fundamental diagram' of traffic flow. Draw this fundamental diagram and clearly explain these relationships. (12 marks)

(f) The spot speeds of five (5) vehicles at mid-point of a straight stretch of a road are 50, 40, 60, 54 and 45km/hr respectively. Find the time mean speed and space mean speed of the vehicles. (5 marks)

QUESTION THREE

(a) Mention five reasons why travel times may vary in Queue analysis. (2 1/2 marks)

(c) In the measurement for traffic volume using 'moving car observer method', the flow of the vehicles is given by:

$$q = \frac{60(x+y)}{Ta + tw}$$

Explain the elements of the formula and show how it is derived. (9 1/2 marks)

(d) Name and briefly describe the two types of speed limits commonly used in traffic management. (8 marks)

QUESTION FOUR

(a) In traffic control, every law, regulation or operating instruction must be communicated through the use of devices / technologies that fall into three broad categories. Explain these categories. (2 marks)

(b) Mention and explain the two categories in which vehicle flow on transportation facilities may be generally classified. (6 marks)

(c) Define the following terms:

i. Diverted traffic

ii. Converted traffic

iii. Induced traffic (3 marks)

(d) Describe the six basic steps that are recommended in any detailed traffic accident study. (9 marks)

QUESTION FIVE

(a) State the two types of traffic delays that could lead to vehicles queuing and explain their causes. (5 marks)

(b) Outline three (3) driver characteristics which influence his / her behavior on the road when driving. (6 marks)

(c) i. Explain the term "Level of Service" (LOS) in relation to traffic movement on roads or highways? (2 marks)

ii. Draw a diagram to show the six levels of service in a road segment and explain each level of service. (7 marks)