



TECHNICAL UNIVERSITY OF MOMBASA

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

BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECV 4502: TRAFFIC ENGINEERING II

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: JULY 2025

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) 20 Marks

- a) Outline the steps in the Nearest neighbor procedure (NNP) for routing service vehicles solving the travelling salesman problem (4 marks)
- b) What are the **THREE** assumptions in User Equilibrium (UE) traffic assignment model? (3 marks)
- c) Briefly describe the Capacity restraint method of traffic assignment (2 marks)
- d) Explain term Hierarchy as applied in Traffic Engineering (2 marks)
- e) Discuss **FOUR** objectives of Road hierarchy (4 marks)
- f) Demonstrate the relationship between land use and Road hierarchy (5 marks)

ANSWER ANY TWO QUESTIONS FROM THIS SECTION



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QUESTION TWO (20 marks)

- a) Outline the,
- i) Limitations of Poisson Models
 - ii) Deterministic Queuing Modes
- (4 marks)
- b) State **THREE**
- i. Functional characteristics
 - ii. Frictional characteristics
- (6 marks)
- c) In certain junction, the average normal flow of traffic on cross roads A and B during design period are 400 and 250 pcu per hour respectfully. The saturation flow values on these roads are estimated as 1250 and 1000 pcu per hour for A and B respectively. The all-red time required for pedestrian crossing is 12 sec. Design two phase traffic signal with pedestrian crossing by Webster method.
- (10 marks)

QUESTION THREE (20 Marks)

- a) Outline the;
- i. Cycle lengths of fixed signals.
 - ii. Objectives of signal timing.
- (2 marks)
(7 marks)
- b) Differentiate between Time Mean Speed and Space Mean Speed. Give example for each.
- (4 marks)
- c) The following are spot speeds observed at Makupa course way: 70,75, 65,79 and 85 km/h. Determine the Time Mean Speed and Space Mean Speed.
- (4 marks)
- d) The functional effectiveness of a highway is measured in terms of its ability to assist and accommodate the flow of vehicles with both safety and efficiency. Mention the required parameters.
- (5 marks)

QUESTION FOUR (20 Marks)

- a) State the terms considered in the design of signal times before presenting the different methods.
- (5 marks)
- b) Two routes connect a city and a sub-urban. During the peak-hour morning commute, a total of 4500 vehicles travel from the suburban to the city. Route 1 has a 96km per hour speed limit and is 9.6km in length. Route 2 is 4.8km in length with a 72kph speed limit. Studies show that the total travel time on route 1 increases 2 minutes for every additional 500 vehicles added. Minutes of travel time on route 2



increases with the square of the number of vehicles expressed in thousands of vehicles per hour. Determine user equilibrium travel time. (15 marks)

QUESTION FIVE (20 Marks)

- a) Explain the cause of Shockwaves and Bottlenecks in our Roads and how they can be minimized. Give examples in your city. (7 marks)

- b) Outline the performance and asset management of signal facility (4 marks)

- c) Vehicles arrivals at a national park main gate are assumed Poisson distributed with an average arrival rate of 1 vehicle every 5 minutes. What is the probability of the following?

- i) Exactly two vehicles arrive in a 15 minutes interval
- ii) Less than 2 vehicles arrive in a 15 minutes interval
- iii) More two vehicles arrive in a 15 minutes interval (9 marks)

