TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF BUILDING & CIVIL ENGINEERING
UNIVERSITY EXAMINATION FOR:

BACHELOR OF TECHNOLOGY IN CIVIL ENGINEERING

TCV 4322: TRAFFIC ENGINEERING II

SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: MARCH 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 Equillibrium (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

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. (2 marks)
   ii. Objectives of signal timing. (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)