



**TECHNICAL UNIVERSITY OF MOMBASA**

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FACULTY OF ENGINEERING AND TECHNOLOGY  
DEPARTMENT BUILDING AND CIVIL ENGINEERING  
**UNIVERSITY EXAMINATION FOR**  
BACHELOR OF SCIENCE IN CIVIL ENGINEERING  
ECV 4413: TRANSPORTATION ENGINEERING 1  
END OF SEMESTER EXAMINATION

**SERIES:** JANUARY 2025

**TIME:** 2 HOURS

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**Instructions to Candidates**

1. Answer **Question One** and any other **Two questions** Only.
  2. All diagrams should be clearly drawn and labeled.
  3. Use of **programmable** calculators and **smart phones** is not allowed.
  4. Each question should be on a fresh page of the answer booklet.
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**Question One (Compulsory)**

- (a) i. Transportation data have a central place in the transportation and traffic systems engineering and planning process. Their importance is expanding in the face of three main influences. Clearly explain these influences and give areas where the results of data gathering / collection are used. (5 marks)
- ii. Explain the reasons why sampling is necessary and important in data collection process. Give appropriate examples. (4 marks)
- (b) Discuss the supply and demand sides and their components that the transport system constitutes. (5 marks)
- (c) In traffic data gathering, especially for modeling purposes, the classification of trips is very important. Explain, giving appropriate examples where necessary, the three main factors or travel elements upon which the classification of trips is based. (6 marks)

- (d) In reference to the moving observer method used to collect flow rate or volume data, show that the flow in the traffic stream is given by:-

$$Q = \frac{M_a + M_w}{T_a + T_w}$$

Where: K = Density

U and V = Speed

T = Time

(10 marks)

### **Question Two**

- (a) Explain the key elements of parking surveys and studies. (4 marks)
- (b) Explain how O – D data are analyzed and the importance and uses of O – D data. (6 marks)
- (c) Explain the surveys and techniques used in collection of data for Origin – Destination (O-D) studies while outlining the sampling methods used. Use appropriate diagrams where necessary. (10 marks)

### **Question Three**

- (a) Outline the effects of traffic congestion on urban transport system and its elements. (4mks)
- (b) Some of the errors encountered in the modeling process are specification, transfer and sampling errors. With aid of clear examples discuss them. (5 marks)
- (c) Explain the criteria used in zoning study areas into traffic zones for transportation data collection. (5 marks)
- (d) Clearly explain the four main quantitative attributes used in the description of transportation network with respect to physical or spatial properties, stating clearly how each is measured and / calculated, (6 marks)

### **Question Four**

- (a) Briefly explain what transportation engineering is. ( 4 marks)
- (b) The most commonly used method to obtain density in traffic streams is the use of presence type detectors which senses the presence of a vehicle within the study area. In respect to this show that density is given by:-

$$K = \frac{O_c (V_l + D_l)}{L}$$

Where:  $V_l$  = Length of the vehicle

$O_c$  = Fraction of time detector is occupied

$D_l$  = Length of detector

K = Density

(16 marks)

**Question Five**

- (a) Name and explain TWO basic attributes used to evaluate transportation systems. (4 marks)
- (b) Describe the FOUR elements that make up the physical plan of most transportation systems. (6 marks)
- (c) With the aid of sketches describe the following networks:-
- i. Circumferential
  - ii. Territorial (10 marks)