



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT BUILDING AND CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:

BSC IN CIVIL ENGINEERING

ECE 2403: TRAFFIC ENGINEERING I

END OF SEMESTER EXAMINATION

SERIES: APRIL 2016

TIME: 2 HOURS

DATE: 18 May 2016

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.

QUESTION 1

- a) Describe the following terms used in traffic engineering
- | | |
|----------------|----------|
| (i) Traffic | (2marks) |
| (ii) Spacing | (2marks) |
| (iii) Headway | (2marks) |
| (iv) Clearance | (2marks) |
| (v) Gap | (2marks) |
| (vi) Flow rate | (2marks) |
| (vii) Volume | (2marks) |
| (viii) Density | (2marks) |

- b) A timer is begun at a time 0.0 seconds for 25 seconds and the time at which the front end of vehicles pass the observation point ,say A-A' are noted as follows:

Vehicle	Time of Passing (sec)
4	3
5	5.2
6	8.2
7	12.1
8	15.5
9	18.2

- i. What are the individual headways? (3marks)
 ii. What is the average headway? (1mark)
- c) Four vehicles, 18, 20,21 and 22ft long ,are distributed over a length of a freeway lane 500ft long.What is the lane occupancy? (1 mark)
- d) (i) Three vehicles are traversing a 1-mile segment of a highway at the following speeds: 50mph, 40mph and 35.3mph.
 Calculate the space mean speed and the time mean speed. (2marks)
- e) Describe ‘level of service’ A-F as applied in traffic analysis (7marks)

SECTION B (Answer any TWO questions from this section. Each question carries 20 marks)

QUESTION 2

- (a) Differentiate between ‘uninterrupted’ and interrupted flows as used in traffic studies (5marks)
- (b) Briefly explain TWO types of traffic signals (5marks)
- (c) Outline FOUR requirements for traffic control devices (4marks)
- (d) Explain the following
- (i) Induced traffic (1mark)
 (ii) Generated traffic (1mark)
 (iii) Mixed traffic (1mark)
- (e) What is ITS and what are two of its disadvantages? (3marks)

QUESTION 3

- (a) (i) State Greenshield's Model (2marks)
- (ii) Given the relationship between speed and density from empirical data as ;
 $U=54.5-0.24k$.
Estimate q_{max} , u_o , k_j (8marks)
- (b) (i) Derive Greenberg's model and show that C is the speed at maximum flow. (10marks)
- (ii) The speed density relationship of traffic on a section of a freeway lane was estimated to be : $v_x=18.2\ln(220/k)$ (6marks)
- a. What is the maximum flow, speed ,and density at this flow? (3marks)
- b. What is the jam density? (1mark)

QUESTION FOUR

- a. Define the following:
- i. Deterministic queuing models (2marks)
- ii. Stochastic queuing models (2marks)
- b. List FIVE advantages of one-way street system (5marks)
- c. Explain the relevance of The Manual on Uniform Traffic Control Device(MUTCD) (1marks)
- d. An airport has a single runway;airplanes have been found to arrive at the rate of 15 per hour.It is estimated that each landing takes three minutes.Assuming a poisson process for the arrivals and an exponential distribution for landing times use an M/M/1 model to determine the following performance measures:
- (i) Runway utilization
- (ii) Expected number of planes waiting to land
- (iii) Expected waiting time
- (iv) Probability that waiting will be more than 5minutes,10minutes and the probability that there will be no waiting. (10marks)

QUESTION FIVE

- (a) Explain the following as used in traffic engineering
- (i) Annual average daily traffic(AADT) (2marks)
- (ii) Annual average weekly traffic(AAWT) (2marks)
- (iii) Average daily traffic (2marks)

- (iv) Design years (2marks)
- (b) State FIVE objectives of traffic engineering (5marks)
- (c) Using hypothetical(fundamental) diagrams clearly describe the connection between mean speed,density and flow. (7marks)