



MACHAKOS UNIVERSITY

University Examinations for 2020/2021 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

FOURTH YEAR FIRST SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (CIVIL ENGINEERING)

ECV 400: TRAFFIC ENGINEERING I

DATE: 12/8/2021

TIME: 8.30-10.30 AM

INSTRUCTIONS

- This paper comprises of five questions. Answer **three** questions
- Question one is **compulsory** and carry 30 marks
- Answer any other **two** questions

QUESTION ONE (30 MARKS)

- a) Briefly discuss Speed-Flow-Density Relationship (8 marks)
- b) Fig 1 below shows vehicles travelling at constant speeds on a two – lane highway between sections X and Y with their positions and speeds obtained at an instant of time by photography. An observer located at point X observes the four vehicles passing point X during a period of T Sec. The velocities of the vehicles are measured as 45, 40, 35 and 20mph respectively. Calculate
- The flow (3 marks)
 - The density (3 marks)
 - The time mean speed (3 marks)
 - The space mean speed (3 marks)

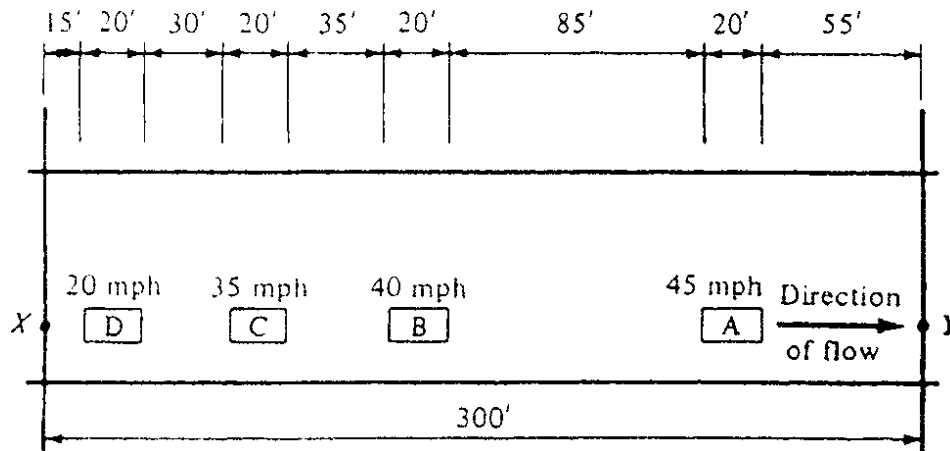


Fig 1: Location and Speeds of Four Vehicles on a Two-Lane Highway at instant of Time

- c) Thika Superhighway has four lanes in each direction. The Thikabound capacity is 8200 veh/hr/lane and the free-flow speed is 65 mph.
- What is the maximum flow rate, maximum density, jam density? (5 marks)
 - If a one-hour vehicle count in the Thikabound direction for the outside lane gives 7034 vehicles in a non-congested condition, what is the estimated spacemean speed of these 7034 vehicles? (5 marks)

QUESTION TWO (20 MARKS)

- Briefly define two main types of traffic Flow (4 marks)
- Using relevant diagrams and equations, discuss the following Traffic flow parameters
 - Time mean speed (4 marks)
 - Space mean speed (4 marks)
 - Density (4 marks)
 - Peak Hour Factor (PHF) (4 marks)

QUESTION THREE (20 MARKS)

- Define the term Intersectional Conflicts as used in Traffic Engineering (2 marks)
- State four types of Intersectional Conflicts (2 marks)
- Briefly discuss two main types of parking facilities used in major towns in Kenya (16 marks)

QUESTION FOUR (20 MARKS)

Using relevant diagrams discuss two main types of intersections used on Kenya roads

QUESTION FIVE (20 MARKS)

- a) Approach flows and saturation flows at a 2-phase signal-controlled intersection are given in Table 1 below. Both intergreen periods are 5 sec and lost times are 2 sec perphase. What is the optimum cycle time? (12 marks)

	N	S	E	W
Approach Flows, PCU/hr	810	750	1470	1200
Saturation Flows, PCU/hr	1800	2000	4200	4000

- b) Calculate the delay at the Junction of Uhuru highway and Kenyatta Avenue road which has a control signal with following details
- Proportion Of The Cycle Which Is Effective Green Is 120 Sec
 - Effective Green Time Is 33 Sec
 - Traffic Flow Is 0.183 Veh/Sec
 - Saturation Flow Is 0.764 Veh/Sec
- (8 marks)