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

END OF SEMESTER EXAMINATION
SERIES: JANUARY 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) Define the following terms as used in traffic characteristics
   - **i.** Headway (1 mark)
   - **ii.** Time headway (1 mark)
   - **iii.** Space headway (1 mark)

b) Define the following terms:
   - i. Average Daily Traffic (ADT) (2marks)
   - ii. Average Weekday Traffic (AWT) (2marks)
   - iii. Average Annual Daily Traffic (AADT) (2marks)

c) What is traffic assignment? (2marks)

d) Give **THREE** aims of traffic assignment (3marks)

e) Differentiate between the following types of speed (4 marks)

i) Running speed
ii) Journey speed

f) State **FOUR** components of congestion costs in traffic management (2 marks)

ANSWER ANY TWO QUESTIONS FROM THIS SECTION

QUESTION TWO (20 marks)

a) Differentiate between the following types of shockwaves. (4 marks)
   i. Backward forming shockwaves
   ii. Backward recovering shockwaves

b) Outline the following road types;
   i. Freeway
   ii. Expressway
   iii. Arterial road
   iv. Collector street (8 marks)

c) State **FOUR** benefits of parking control and restraints in traffic management (2 marks)

d) You are entering an arena to watch a basketball game. There is only one ticket line to purchase tickets. Each ticket purchase takes an average of 18 seconds. The average arrival rate is 3 persons/minute. Assuming M/M/1 queuing, find:

   i) Average length of the queue and
   ii) Average waiting time in queue (6 marks)

QUESTION THREE (20 Marks)

a) Discuss **FOUR** common forms of vehicle movement control traffic management (4 Marks)

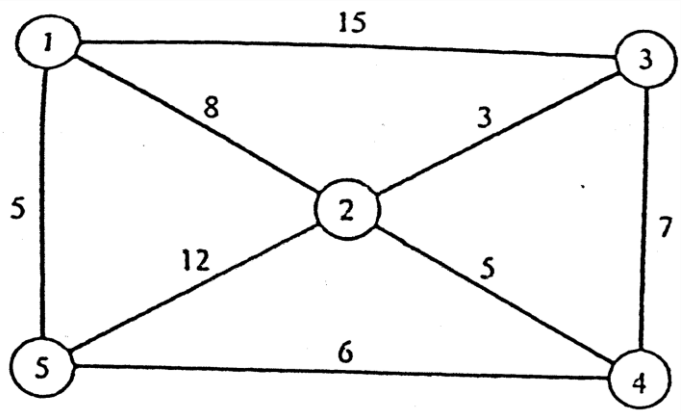
b) Briefly describe the stochastic queuing analysis method. (5 marks)

c) In reference to queuing analysis, describe the 'diffusion approximations" (5 marks)

b) A movie theater ticket booth has a mean arrival rate of 3 persons/minute and the service rate is 4 persons/minute. Calculate the characteristics of this queuing system applying the M/M/1 model. (6 marks)

QUESTION FOUR (20 Marks)

A highway network consisting of five nodes and eight links is shown in the figure below. The cost of transportation is also shown. A trip table showing the numbers of vehicles per hour wanting to go from one node to another is also provided. Assign the trips to the network using the all-or-nothing method. All the links are two-way. Find the total volume on each individual link and the total cost of all the trips.



Trip-Table

From \ To	1	2	3	4	5	
1	0	50	60	70	30	210
2	40	0	30	60	80	210
3	90	40	0	20	50	200
4	80	70	90	0	30	270
5	30	40	50	60	0	180
	240	200	230	210	190	1070

QUESTION FIVE (20 Marks)

a) Using speed Vs flow of vehicles relationship given in fig 1 below, describe the flow conditions in zone SP, PBC and OC. (6 marks)

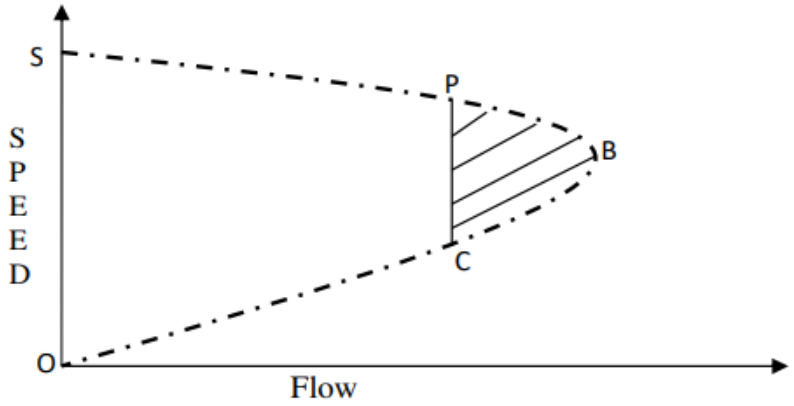


Fig 1

b) A 3-lane expressway (one direction) is carrying a total volume of 5020 vehicles per hour when an incident occurs resulting in the closure of two lanes. If it takes 100 minutes to clear the obstruction, assuming the capacity of the highway is 2040 vehicles hour per lane, and assuming also that deterministic conditions exist determine the following:

i. The maximum queue length that will be formed
ii. The total delay
iii. The number of vehicles that will be affected by the incident
iv. The average individual delay (14 marks)