TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF BUILDING & CIVIL ENGINEERING
UNIVERSITY EXAMINATION FOR:
BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECE 2403: TRAFFIC ENGINEERING 1

SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: SEPTEMBER 2018
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) 30 Marks

Table 1 shows speed and density observations at a rural road. Determine the following: -

a) Maximum flow
b) Velocity at maximum flow
c) Density at maximum flow
d) Greensberg expression (30mks)

Table 1

Speed (km/h)	Density (veh/km)
53.2	20
48.1	27
44.8	35
40.1	44
37.3	52
35.2	58
34.1	60
27.2	64
20.4	70
17.5	75
14.6	82

13.1	90
11.2	100
8.0	115

ANSWER ANY TWO QUESTIONS

Question Two (20 Marks)

Figure Q2 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 X during a period of T Seconds. The velocities of vehicles are measured as 45, 45, 40 and 30km/h respectively.

Calculate the following;

a) Flow
b) Density
c) Time- mean speed in km/h
d) Space-mean speed in km/h

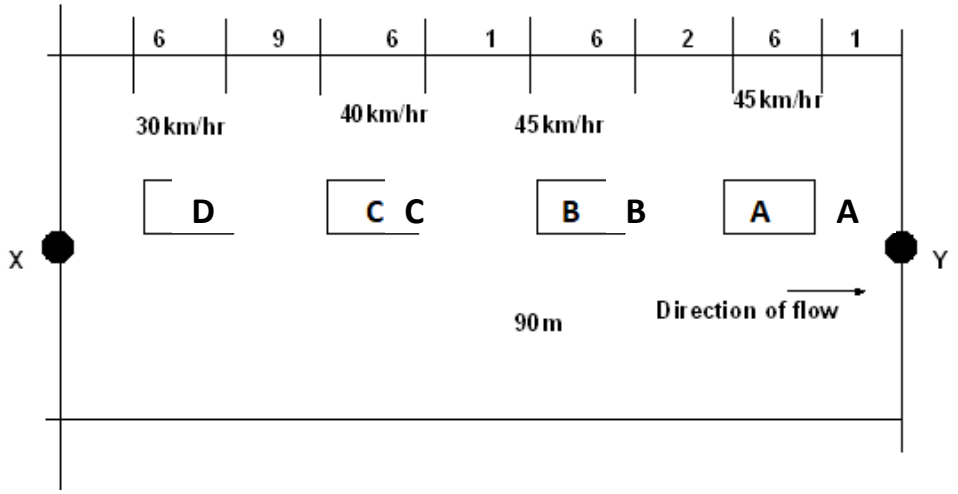

Fig Q2

Question Three (20 Marks)

Table Q3 shows data collected from travel time study using the moving – vehicle technique. If the test section was 2 km and the total delay was observed to be 2 minutes, determine the running speeds in km/h given that the data in parenthesis are for eastbound and the other for westbound. (20 marks)

TABLE Q3

RUN DIRECTION	TRAVEL TIME(MIN)	NO. OF VEHICLES TRAVELLING IN OPPOSITE DIRECTION	NO. OF VEHICLES OVERTAKING TEST VEHICLE	NO. OF VEHICLES OVERTAKEN BY TEST VEHICLE
1(1)	2.95(2.75)	78(80)	2(1)	0(1)
2(2)	3.15(2.55)	83(75)	1(2)	1(1)
3(3)	3.20(2.85)	89(83)	1(0)	1(3)
4(4)	2.83(3.00)	86(78)	1(0)	0(1)
5(5)	3.30(3.05)	80(81)	2(1)	1(1)
6(6)	3.00(2.70)	79(79)	1(3)	2(2)
7(7)	3.22(2.82)	82(82)	2(1)	1(1)
8(8)	2.91(3.08)	81(78)	0(0)	1(2)

Question Four (20 Marks)

a) Enumerate FOUR benefits of a properly designed and timed traffic signal **(4marks)**

b) Distinguish between local controller and master controller as hardware components of a signal system **(4marks)**

c) Using the Webster's delay model determine the average intersection delay per vehicle (d) given the following data;

Flow = 600 vehicles per hour
Green time = 28 sec
Cycle length = 60sec
Yellow time = 60 sec
Saturation flow = 1800 vehicles per hour
Starting delay = 2 sec **(12 Marks)**

Question Five (20 Marks)

a) State THREE primary objectives of street lighting **(3Marks)**

b) (i) Distinguish between photometric and lighting installation terms

(ii) Define the following terms as used in street lighting installations:

(a) Luminous flux

(b) Luminous intensity

(c) Illuminance

(d) Luminance

(iii) With the aid of a sketch show the components of a street lighting lamp post **(12 marks)**

c) State five characteristics of a bright street lighting patch **(5 marks)**