TECHNICAL UNIVERSITY

OF MOMBASA

UNIVERSITY EXAMINATIONS

2015/2016 ACADEMIC YEAR

FOUTH YEAR EXAMINATIONS

FOR THE DEGREE OF

BACHELOR OF SCIENCE

IN

CIVIL ENGINEERING

COURSE CODE: ECE 2411

COURSE TITLE: TRAFFIC ENGINEERING 2

TIME: 2 HRS

INSTRUCTIONS TO CANDIDATES

- ***THIS PAPER CONTAINS FIVE QUESTIONS***
- ***ANSWER QUESTIONS ONE ANY OTHER TWO QUESTIONS***
- ***MARKS TO QUESTIONS ARE AS SHOWN***
- ***DO NOT USE A PROGRAMMABLE CALCULATOR***
- ***NO MOBILE PHONES ALLOWED IN THE EXAMINATION ROOM***

THIS PAPER CONSISTS OF (5) PRINTED PAGES

QUESTION ONE

a) (i) Explain the term graph theory.

(ii) State its origin

(iii) Distinguish between a path and a trail (6mrks)

b) State reasons why vehicle routing is one of the areas that is most ripe to be the beneficiary of revolutionary advances in information and communications technologies (4mrks)

c) (i) Shock wave theory provides a simple means to predict traffic conditions in time and space but however has limitations. Enumerate these limitations (5mrks)

(ii) Figure Q1C shows a section of a motorway where an accident occurs at 7.00am at a point B. At first, the vehicles involved block the entire carriageway. After 15min, one lane is cleared of traffic flows past point B. The following data is provided.

- Flow at A: q = 2700veh/h, v=90km/h
- Flow at B, one-lane: q=1500veh/h, v=7.5km/h
- Flow at B, two-lane: q=3600veh/h, v=60km/h
- Queue density: Kmax=300veh/km.

Determine the following;

- The end of the queue at 7.15 am
- The time the vehicles are forced to stop by the queue.
- The maximum queue size
- The maximum distance of the end of the queue from the site of the accident.
- The time the second lane should clear if disturbance to the traffic flow resulting from the accident is not to extend to entrance A. (15mrks)

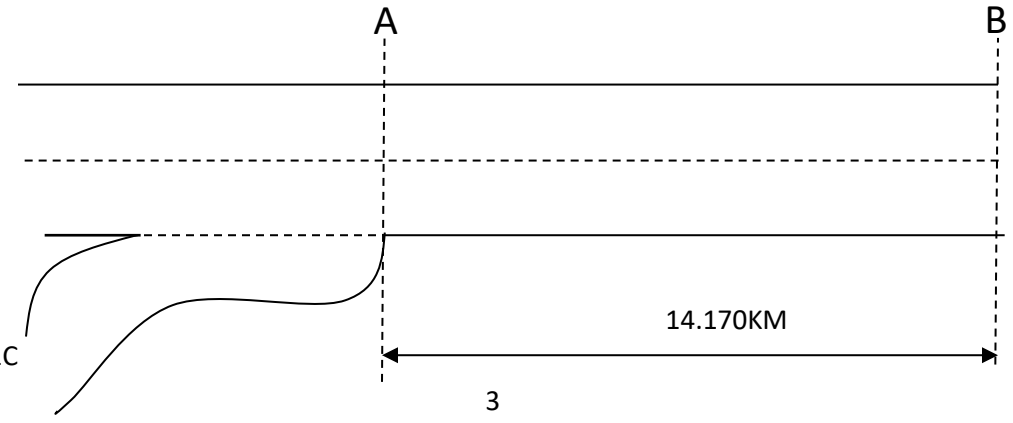

Figure Q1C

QUESTION TWO

a) The capacity of a highway link suddenly reduced by a width restriction at road works to a maximum flow of 1000veh/h and the speed of all vehicles to 5km/h. During off-peak periods the flow may be represented by a block of demand which increases instantaneously to a flow of 1500 veh/h and which before it reaches the width restriction has an average speed of 80km/h. the flow continues for a period of 20 minutes and then falls instantaneously to the off-peak level of flow.
Calculate the maximum length of queue which occurs at deriving the appropriate formula from first principles; determine the maximum length of queue which occurs at the restriction during peak periods. (13mrks)

b) Outline the two general types of traffic bottlenecks (7mrks)

QUESTION THREE

a) Enumerate the six methods that have been developed for undertaking traffic assignment (6mrks)

b) State for purposes of traffic assignment (7½ mrks)

c) Explain what the choice of assignment procedure to be adopted in any particular transportation study depends on (2mrks)

d) The relationship between journey time and volume on a 2km link is given by the model;

$$T = T_0\left[1 + 0.15\left\{\frac{\text{Assigned volume}}{\text{Practical capacity}}\right\}^4\right]$$

Where T= journey time at which assigned volume can travel on the appropriate link.

T_0= base journey time at zero volume and is given 0.75 times the journey time at practical capacity.

The link has a practical capacity of 40,000 vehicles per day and a capacity speed of 60km/h.

After the network has been loaded the link is observed to have 80,000 vehicles per day assigned to it.

Determine the travel time in minutes for the assigned volume (4½ mrks)

QUESTION FOUR

a) Outline the four levels of road hierarchy for network planning and development (8mrks)

b) Outline areas where four level road hierarchy can be used in areas of transport planning and road network management (10mrks)

c) Enumerate the scales contained in continuum modelling (2mrks)

QUESTION FIVE

Using Dijkstra's Algorithm, find the shortest path between vertex A and vertex E (20mrks)