TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR DECREE IN:

BACHELOR OF SCIENCE IN CIVIL ENGINEERING (BSCE)

ECE 2411: TRAFFIC ENGINEERING II

END OF SEMESTER EXAMINATION
SERIES: APRIL 2015
TIME ALLOWED: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
- *Answer Booklet*
- *Pocket Calculator*

This paper consists of **FOUR** questions. Answer question **ONE (COMPULSORY)** and any other **TWO** questions
Maximum marks for each part of a question are as shown
Use neat, large and well labeled diagrams where required
This paper consists of **THREE** printed pages

Question One

a) Clearly explain the concept of stationery and non-stationery traffic flow and illustrate your explanation using appropriate diagrams **(6 marks)**

b) Describe the interrupted and uninterrupted traffic flow and state where they do occur in practice **(6 marks)**

c) (i) What is a Road Hierarchy? **(2 marks)**

(ii) In order for the hierarchy to be an effective planning tool, three groups of desirable performance criteria are identified. Briefly explain each group **(6 marks)**

d) Using sketches, distinguish the following traffic flow regimes stating mathematically, when they do occur free flow, congested flow, and capacity flow **(10 marks)**

Question Two

a) Explain using sketches, the terms "shock wave" and "platoons" as applied in traffic engineering and clearly explain when a shock wave is +ve or –ve **(6 marks)**

b) A road consists of 4 lanes, 2 in each direction. The maximum capacity of 2 lanes in one direction is 2000 vehicle/hour. When vehicles are stationery in a jamming condition, the average length occupied by a vehicle is 6.25cm. During a period of observation, the actual volume of traffic in one direction is steady at the rate of 1200 vehicle/hour. This flow is brought to a halt when the traffic signal turns red and a queue forms. Find the time in seconds which elapses from the moment the signal turns red until the stationery queue reaches another intersection 75m from the signal. Assume a linear relationship between speed and concentration. **(14 marks0**

Question Three

a) Differentiate between the following:
   (i) Headway (h)
   (ii) Spacing (s)
   (iii) Gap (g)
   (iv) Clearance (c) **(8 marks)**

b) What is "Peak Hour Factor" (PHF)? An engine from Mombasa country collected the following traffic flow data from the field:

Time	Number of Vehicles
5.00 – 5.15	1000
5.15 - 5.30	1100
5.30 – 4.45	1200
5.45 – 6.00	900

   (i) Compute the Peak Hour Factor (PHF) using the given information
   (ii) Complete the table above and show the rate of flow for time interval
   (iii) What is the significance of PHF in traffic engineering design **(12 marks)**

Question Four

a) Explain "Trip Assignment" and using a simple sketch, show traffic assignment from some origin to some destination **(5 marks)**

b) Explain the "All-or-Nothing" method used to assign traffic in given networks **(3 marks)**

c) A link, 1km long has a practical capacity of 40,000 vehicle/day and a speed at that capacity of 40kph. The travel time at that volume is 1.5 minutes (zero flow). Calculate the number of vehicles per day assigned to it after the link is loaded. **(12 marks)**

Question Five

a) Discuss the graph theory and clearly explain how it is applied in the transportation network system **(6 marks)**

b) Assign the vehicle trips shown in the following O-D trip table to the network using the all-or-nothing assignment technique. To summarize your results, list all of the links in the network and their corresponding traffic volume after loading.

Origin – Destination Trip Table

FROM/TO	**TRIPS BETWEEN ZONES**				
	1	2	3	4	5
1	-	100	100	200	150
2	400	-	200	100	500
3	200	100	-	100	150
4	250	150	300	-	400
5	200	100	50	350	-

Highway Network **(14 marks)**