TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:
BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECE 2411: TRAFFIC ENGINEERING II

END OF SEMESTER EXAMINATION
SERIES: DECEMBER 2013
TIME ALLOWED: 2 HOURS

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

This paper consists of **FIVE** questions. Answer question **ONE (Compulsory)** and any **TWO** questions
Maximum marks for each part of a question are as shown
This paper consists of **THREE** printed pages

Question One (Compulsory)

a) Clearly explain the concept of stationery and non-stationary 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 term "shock waves" 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 6.25m. 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 half 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 interaction 75m from the signal. Assume a linear relationship between speed and concentration. **(14 marks)**

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 engineer from Mombasa county collected the following traffic flow data from the field:

Time	**Number of vehicles**	
5.00 – 5.15	1000	
5.15 – 5.30	110	
5.30 – 5.45	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 somet origin to some destination. **(5 marks)**

b) Explain the "All-or-Northing" method used to assign traffic in given networks. **(3 marks)**

c) A link 1km long has a practical capacity of 40,000 vehilce/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 transport action network system. **(6 marks)**

b) The road network for Mombasa city is given in figure Q5. The numbers represent the generalized link costs. Taking A as the origin zone centroid (home trade):

(i) Which is the shortest route for each origin destination A-C, A-D, A-E B-C, B-D and B-E

(ii) Assign the traffic demand to the road network with the all-or-nothing" (AON) method, using the following O/D vehicular trip table.

	C	D	E
A	200	400	350
B	500	75	100

Figure 1

(iii) Which link in the network has the highest assigned volume? **(14 marks)**