TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:
BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECE 2318: TRANSPORTATION ENGINEERING I

SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: AUGUST 2016
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 **TWO** printed pages

Question One (Compulsory)

a) Describe the following techniques which are used in queuing analysis:
   (i) Deterministic
   (ii) Stochastic **(14 marks)**

b) A movie theatre both has arrival rate of 4 persons per minute and a service rate of 5 persons per minute. Using a M/M/1 model calculate the characteristics of the system by determining.

   (i) Mean number of persons in the system (L)
   (ii) Mean number of persons in the waiting line (Lq)
   (iii) Mean time in the queuing system (w)
   (iv) Mean time in the queue (Wq)
   (v) Percentage idle time (I) **(12 marks)**

c) Explain the 'littles' law as used in queuing analysis. **(4 marks)**

Question Two

a) Describe the diffusion approximations as used in queuing analysis **(10 marks)**

b) (i) Customers arrive at a ticket counter in a local theatre at a rate of 300 persons per hour at 6.00 p.m. After 20 minutes the arrival rate declines to 80 persons per hour and continues at that rate for 30 minutes. If the time required to serve one is 30 seconds, describe the performance of the queue. Draw the graph for D/D/I queue. **(8 marks)**

(ii) The arrival pattern to a facility can be categorized into two. Name and briefly describe them. **(2 marks)**

Question Three

a) The two main aspects of a queue service system include configuration of the service system and the speed of the service system. Describe each one of them. **(12 marks)**

b) In relation to queue modeling explain the importance of diffusion approximations. **(8 marks)**

Question Four

a) Describe the queuing theory and its evolution. **(8 marks)**

b) One of the components of a basic queuing is the arrival portern at the system. In relation to this, describe the following:

(i) Static arrival

(ii) Dynamic arrival **(8 marks)**

c) Briefly explain 'saturation' and 'under saturation' as used in queuing systems. **(4 marks)**

Question Five

a) Describe 'poisson distribution' as applied in queuing analysis. **(8 marks)**

b) Piones land on a runway (one runway) in a given airport. In the airport there are 40 arrivals per hour whose arrival times are poisson distributed. The loading time is 120 seconds and is deterministic in nature. If the fuel cost is given as 8000/- per hour, calculate:

(i) Average length of the queue

(ii) Average waiting time

(iii) Expected number of planes in the system

(iv) Fuel cost per hour as a result of the delay **(10 marks)**

c) In relation to queue discipline, state what the following stand for:

(i) SIRO

(ii) FIFO

(iii) FILO **(2 marks)**